NOVEMBER, 1943

20,100 COPIES

TOOL & DIE JOURNAL

TOOLING AND PRODUCTION

(1) 1⅞" left hand spiral, right hand cut end mill.

(2) 13/16" two flute, double end router bit.

(3) 3/16" extra long, four flute, double end mill.

Even These Are

STANDARD TOOLS

ON HAND FOR

48-HOUR DELIVERY

Standard lines of Putnam Hi-Speed End Mills include not only every popular size and type of tool but many which, from any other source, would be considered "special" cutters. As examples, the three tools illustrated are carried in stock. These, like all other standard Putnam Tools, are now available for 48-hour delivery.

For complete information, see your nearest Putnam representative or write directly to the factory.

ARMY (E) NAVY

PUTNAM TOOL COMPANY

9005 CHARLEVOIX AVE. - DETROIT - MICH.

SPEED UP THE JOB

Conserve LABOR AND MATERIAL

Use FCC Air Hardening Tool Steel Cast-to-Shape for blanking, forming, drawing, swaging and embossing dies; also for bushings, cams, shears, rolls and similar tooling.

These Cast-to-Shape steels deliver the job to you already half done. With only ⅛" to be machined off, even on the most intricate shapes, your dies can be put into production more quickly and at greater saving.

Cast-to-Shape tool steels are produced in a variety of analyses offering unusual resistance to wear and abrasion. They are manufactured in electric furnaces under precision laboratory control.

Back the Attack with War Bonds

Prompt delivery
to your specifications

Write Today
For Booklet K

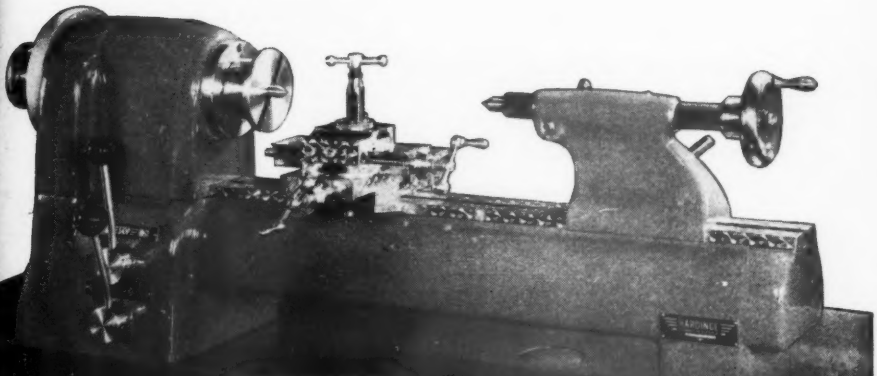
QUALITY FCC SERVICE

THE FORGING and CASTING CORPORATION

FERNDALE (DETROIT) MICHIGAN

PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR

HARDINGE
ELMIRA, N.Y.



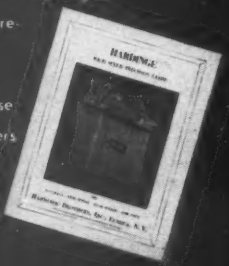
HARDINGE High Speed Precision Lathe

SPECIFICATIONS:
1" collet capacity, 9" swing, 17" center distance, eight spindle speeds up to 4000 R.P.M.

Designed to meet requirements of extreme lasting accuracy, high spindle speeds and the ease in operation required for the smaller diameter work range found in every tool room, laboratory and production department.

The simplicity of operation enables relatively unskilled operators to produce parts to the necessary close limits without expensive tooling. Your larger, expensive equipment will not meet all of the foregoing requirements necessary for practical results and proper economy.

Because of the many advantages found through actual use, Hardinge Precision Lathes are being installed in increasing numbers.



Ask for this 4 page bulletin which gives full details

A PROVEN LOW COST UNIT FOR

HARDENING

1300° to 2350° F.

3 in 1 Furnace
For All Types of TOOLS

1 For PREHEATING High Speed steels or [illegible] ing water or air hardening steels—1350° to [illegible] F.

2 For HARDENING High Speed Steels any type or any alloy steel from 1750° to 2350° F.

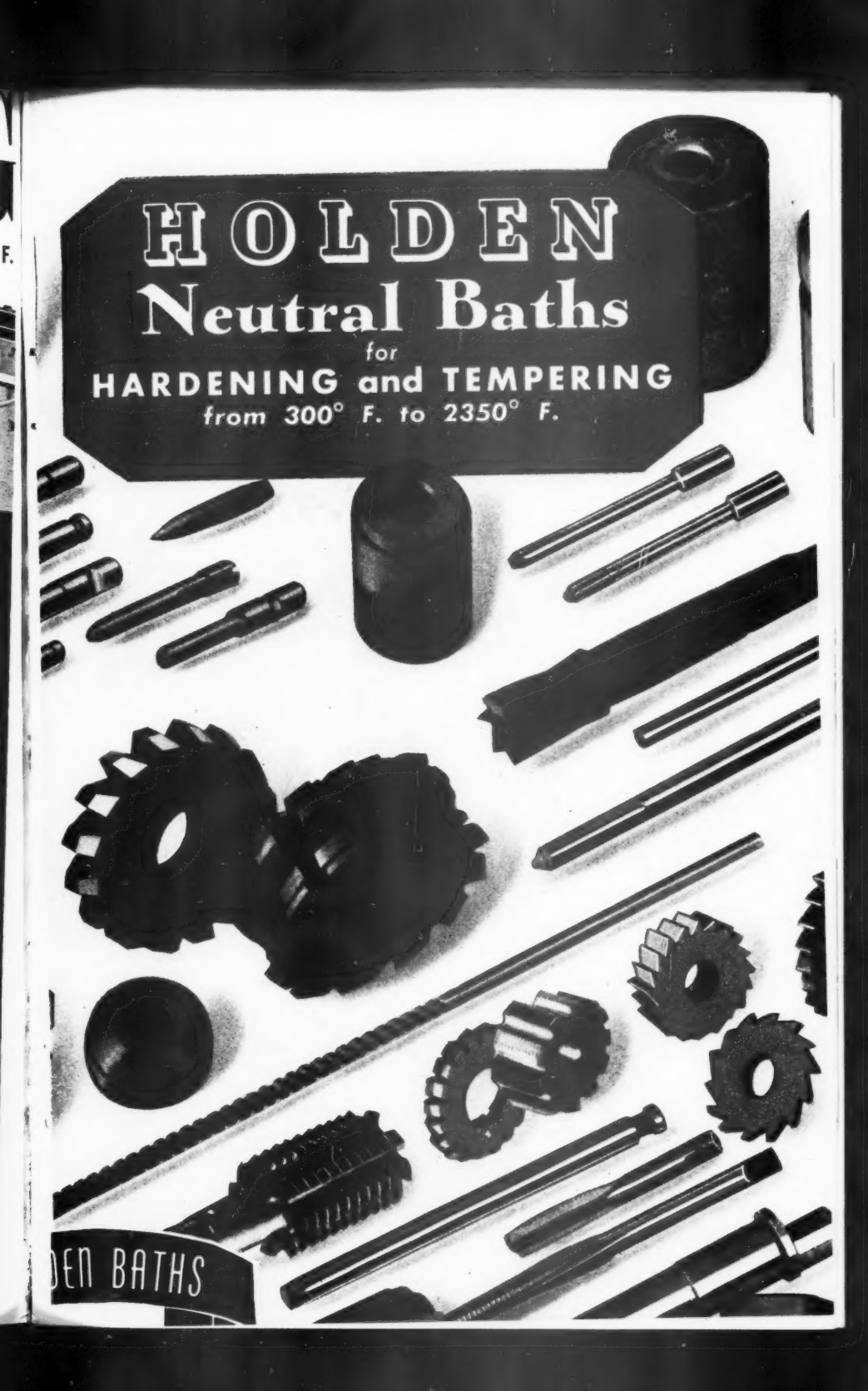
3 QUENCHING unit for High Speed Steels or Alloy Steels.

SCALE-FREE HARDENING
NO DECARBURIZATION
75% Less Floor Space for Same Production

THE A. F. HOLDEN COMPANY

NEW HAVEN 6, CONNECTICUT

BASE METALS BEHAVE LIKE NOBLE METALS in HOL


HOLDEN
Neutral Baths
for
HARDENING and TEMPERING
from 300° F. to 2350° F.
DEN BATHS

RUGGED ACCURATE BED . .
Another Finer Feature of Logan Lathes

The accuracy you need for precision work is yours in a Logan Lathe, even after long continuous use. For Logan combines solid strength and Nth degree accuracy in every Logan Lathe bed. Extra heavy ribbed and warp-free, the Logan bed is machined from the finest special analysis castings obtainable. Its V ways and flat ways are precision ground to an accuracy of within .001 of an inch from end to end. This fine construction, usually found only in the highest priced lathes, is another reason why alert production men are depending more and more on Logan Lathes for low cost production of small parts.

Write today for catalog sheets giving complete specifications on all models of Logan Lathes . . . Quick Change Gear Types . . . Manufacturing Turret Lathes . . . Hand Screw Machines . . . Floor Model Back Geared Screw Cutting Lathes . . . Bench Model Back Geared Screw Cutting Lathes.

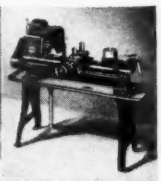
LOGAN ENGINEERING COMPANY
Chicago, Illinois

BRIEF SPECIFICATIONS

Swing over bed, 10½" . . . bed length, 43½" . . . spindle hole, $\frac{25}{32}$" . . . capacity, ½" with push type collet . . . 6-position automatic indexing turret . . . stroke of turret, 4¼" . . . 12 spindle speeds from 30 to 1450 r.p.m. . . . all moving parts protected by ball bearings or self-lubricating bronze bearings.

Logan . . . A NAME TO REMEMBER WHEN YOU THINK OF LATHES

No. 830 — ½" Capacity Hand Screw Machine



No. 850 — Manufacturing Turret Lathe

PRECISION CONTROL of FEED and PRESSURE
The Production Saws of Modern Industry

Efficient, accurate control is essential in War Production today. Racine provides this precision with the above compact, control unit. Two dials sensitively control pressure and feed —a flexible feeding action that automatically regulates itself to the kind, size and shape of work, speeds production and saves blades. Capacity 6" x 6"

Other Features of Racine "Oil Cut" Saws

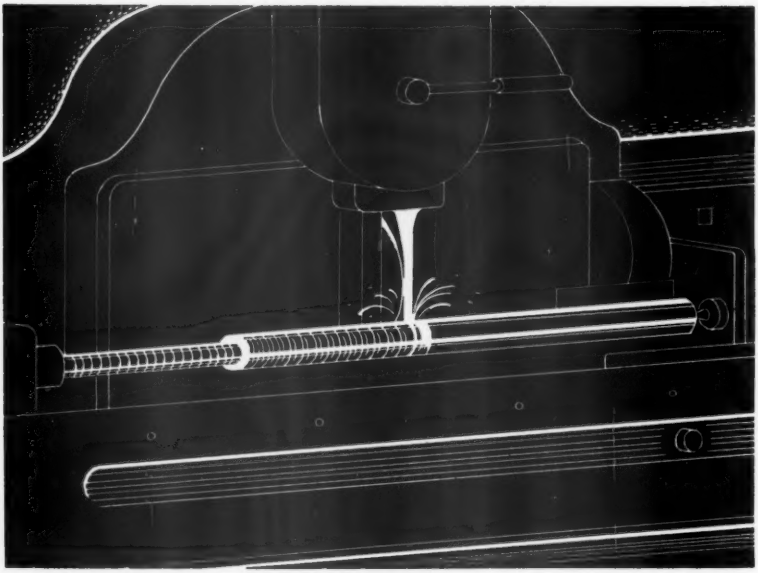
Three-speed transmission for high speed production — Double Vise Jaws — Saw frame eliminates blade distortion — Adjustable Saw Guide. Other model capacities 6" x 6" to 20" x 20". There is a Racine Saw that will do your job. Complete information and prices on request. Address Dept. TD-S.

RACINE

INVESTIGATE RACINE OIL HYDRAULIC PUMPS AND VALVES

Racine "Variable Volume" Oil Hydraulic Pumps for moulding, feeding, holding and pressing operations. Capacities 0-12, 20 and 30 G.P.M. Pressures from 50 to 1000 lbs. per sq. inch. Four-Way and other Oil Hydraulic Valves in 3/8" to 1 1/2" sizes.

A Modern Source of Hydraulic Force



GILRON THREAD GRINDING COOLANTS ARE TAILOR MADE!

Aircraft parts, standard and special gages and a myriad of precision specialties to fill our war needs require thread grinding operations.

Gilron engineers have developed an oil (coolant) to materially increase production speed and output of inspector-approved work.

As a tailor-made product it is adjusted to meet the working conditions of each plant according to material ground, finish, grinder and desired speed and feed.

A convincing list of satisfied users testifies to the value of this *new* Gilron development. It will pay you to investigate. Write for data unit T.

Gilron PRODUCTS COMPANY

1557 EAST 40th STREET
CLEVELAND, OHIO

SCIENTIFIC COOLANTS
DRAWING-GRINDING-CUTTING

QUICK, ECONOMICAL
LEVEL MACHINE INSTALLATIONS

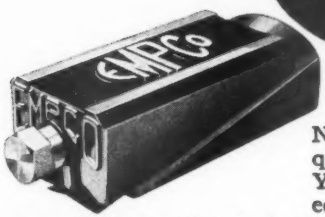
with

Empco JACKS

Adaptable to any floor, even or uneven.

EMPCO PRODUCTS

Look for this emblem; it is your guarantee of quality.



Now you can set up your machines more quickly and accurately than ever before. Yes, this EMPCO Jack is your answer to economical machine installations, because they require less time to do the job. EMPCO Jacks will also save time in periodic re-levelling because a simple turn of the "hex" screw head will raise or lower machine until perfectly level. It's the work of an instant. EMPCO Jacks are available in the following sizes:

Write for prices today or if you need them in a hurry, wire sizes you want and we'll ship immediately.

	Normal Height	Width	Normal Length
No. 1 (small)	2"	2 9/16"	4 1/2"
No. 2 (medium)	2 3/8"	3"	6 1/4"
No. 3 (large)	3 1/4"	4"	8 1/4"

IMMEDIATE DELIVERY

All shipments made from stock—orders shipped same day they're received.

EMPCO

THE ENTERPRISE MACHINE PARTS CORPORATION

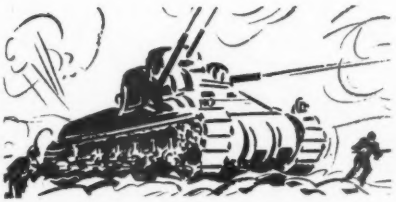
2735 JEROME AVE. DETROIT, MICH.

● Straight to the heart of the drill jig problem goes the fast accurate performance of the Siewek line of Rapid Clamping Drill Jigs. They feature ample loading clearance, chip clearance and lubricating clearance. Users say they are absolutely unique for parts that come within the interchangeable class.

Contact a Siewek representative in your territory or write us. Send for Catalog No. 5.

SIEWEK TOOL DIVISION
of DOMESTIC INDUSTRIES, INC.
DETROIT (FERNDALE STATION) MICHIGAN

REPRESENTATIVES IN PRINCIPAL CITIES

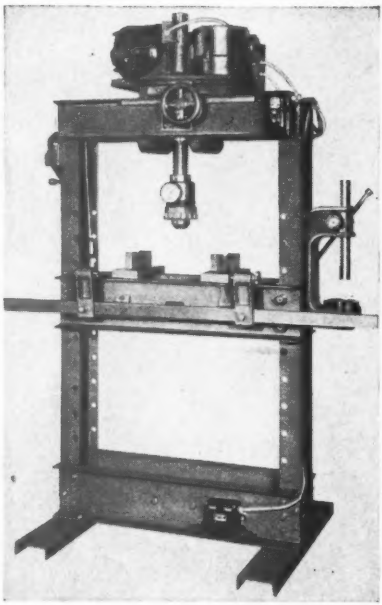


PRESSUREMATIC

POWER PRESSES

CUT MAN-HOURS ON TANK PRODUCTION

They're press-fitting tank parts—plenty of 'em—faster, easier, better with automatic solenoid pressure controls. Foot pedal automatic control enables operator to exert an initial tonnage of any desired pressure and then increase pressure to any point up to maximum without backing ram off work.



- DEVELOPS 60 TONS PRESSURE IN 4 SECONDS
- ADJUSTABLE BOLSTER
- FOOT PEDAL SWITCHES
- MOVABLE RAM HEAD
- CHOICE OF PRESSURES, RAM TRAVELS, AND RAM SPEEDS

★ HYDRAULIC AND ELECTRIC MODELS

★ 40 and 60 TON CAPACITIES

★ PRE-SELECTED PRESSURE CONTROLS

★ GOOD DELIVERY!

EXCLUSIVE AUTOMATIC PRESSURE CONTROL

With optional automatic pressure control operator simply sets the regulator hand on the dial gauge to any pressure. When that pressure is reached, the power cuts off instantaneously and a solenoid operated magnetic brake stops the ram.

PRICED

$215

TO

$1398

WRITE FOR DETAILED CIRCULAR

LEMPCO

5713 DUNHAM ROAD
BEDFORD, OHIO

FIRTHITE
SINTERED CARBIDES
FOR UNIFORM
PRECISION
WAR'S "appetite" for interchangeable parts knows no bounds. Since interchangeability depends upon **uniform precision,** tools must **stay** sharp on long runs or long cuts.—That's where FIRTHITE Sintered-Carbide Cutting Tools excel. Their near-diamond hardness maintains **uniform precision** in mass production and on hard materials.
ARMY
E
NAVY
STEEL COMPANY

FIRTHITE Lamination Dies have blanked, on one grinding, more pieces than an alloy tool-steel die punched in its entire "life." (On this operation a good steel die produces about a million pieces.) This Firthite Die has produced, with only a few honings, over ten million pieces and may be good for as many more.

Firthite Dies retain their original sharpness much longer than any steel dies. They cut clean and free—reduce burring, distortion, dimpling, and buckling. Firthite Dies also resist chipping or breaking, even in case of a miscut. They are superior for notching as well as blanking. A Firthite Engineer will gladly give you details.

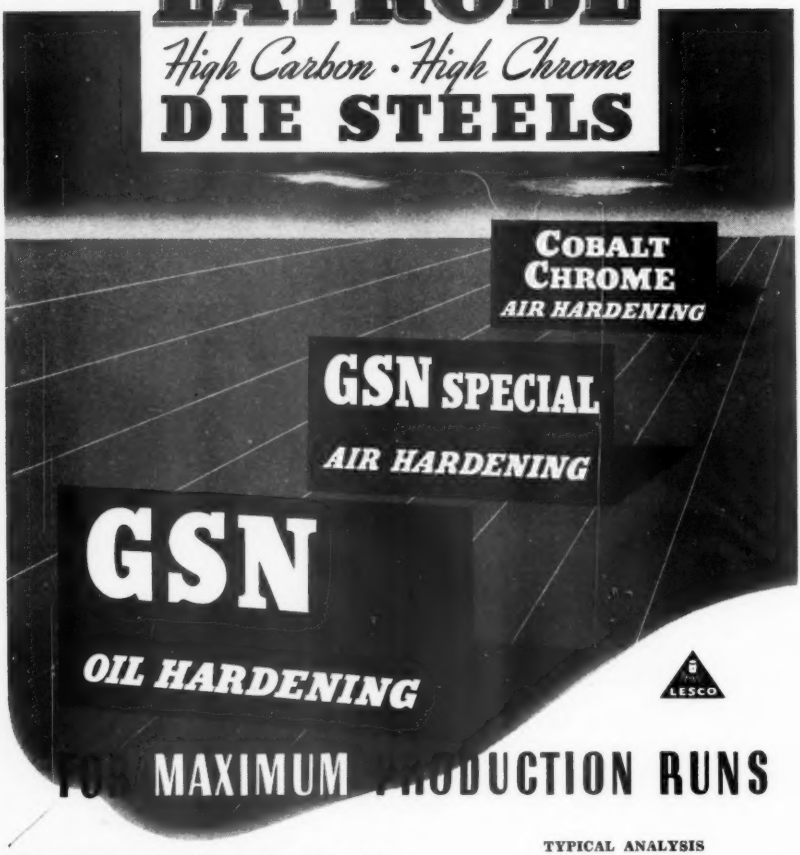
Firth-Sterling
STEEL COMPANY

Offices: McKEESPORT, PA. · NEW YORK · HARTFORD · PHILADELPHIA
CLEVELAND · DAYTON · DETROIT · CHICAGO · LOS ANGELES

LATROBE

High Carbon · High Chrome

DIE STEELS



FOR MAXIMUM PRODUCTION RUNS

These steels are playing their part in making possible the vast production of war materiel. They help provide the Dies, Punches, Gauges and many other precision tools that must produce and keep producing the countless parts that go into our planes, ships, tanks, guns and ammunition.

One of our service engineers can help you determine which of these essential Latrobe Steels will best meet your requirement, thus assuring you of **maximum production runs!**

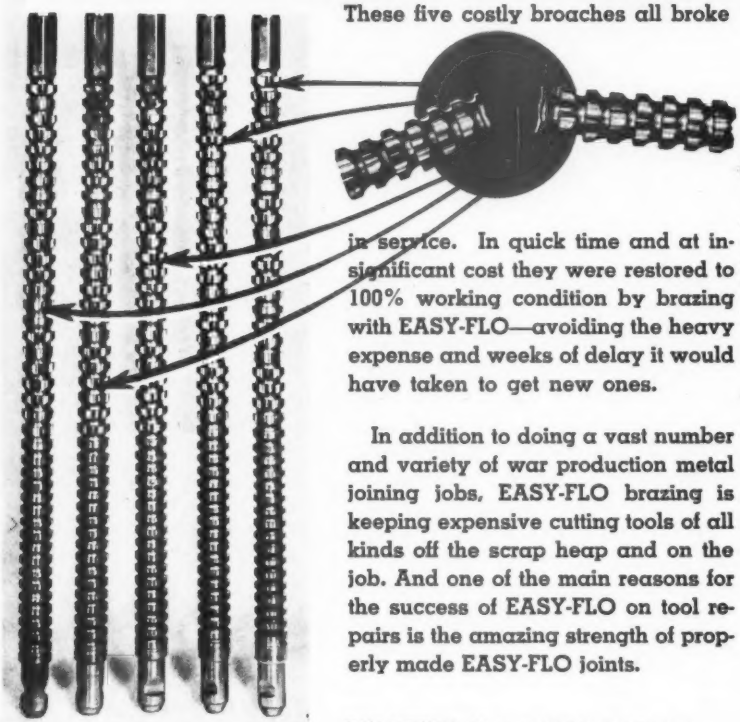
TYPICAL ANALYSIS

	C	Si	Mn	Cr	V	Mo	Co
G S N							
Oil Hardening	2.20	.50	.50	13.20	—	—	—
G S N SPECIAL							
Air Hardening	1.50	.30	.30	11.50	.30	.70	—
COBALT CHROME							
Air Hardening	1.35	.50	.25	12.50	—	.70	3.00

Latrobe ELECTRIC STEEL COMPANY

MAIN OFFICES *and* PLANT · · LATROBE · PENNSYLVANIA

A FEW OUNCES OF EASY-FLO SAVE $1000 WORTH OF BROACHES



These five costly broaches all broke in service. In quick time and at insignificant cost they were restored to 100% working condition by brazing with EASY-FLO—avoiding the heavy expense and weeks of delay it would have taken to get new ones.

These broaches are over 2 inches in diameter and about 5 feet long.

In addition to doing a vast number and variety of war production metal joining jobs, EASY-FLO brazing is keeping expensive cutting tools of all kinds off the scrap heap and on the job. And one of the main reasons for the success of EASY-FLO on tool repairs is the amazing strength of properly made EASY-FLO joints.

BULLETIN 12-A GIVES DETAILS

Gives the reasons back of the high strength and the speed, reliability and low cost of EASY-FLO brazing. Copy mailed on request.

ARMY (E) NAVY

FOUNDED 1867

HANDY & HARMAN

82 FULTON ST., NEW YORK 7, N. Y.

Bridgeport, Conn. • Chicago, Ill. • Los Angeles, Cal. • Providence, R. I. • Toronto, Canada

Agents in Principal Cities

Faster DEEP DRILLING!

. . . . BECAUSE OF

OIL AT THE CUTTING EDGE

THE SUPER-KOOL OIL-HOLE DRILL is the answer to the problem of how to speed up deep-drilling without damaging the drill and without impairing the quality of the work.

Having two oil holes which follow the twist of the drill the entire length of the shank, the Super-Kool insures a constant supply of oil right at the cutting edge. This makes it possible to increase greatly the rate of speed of the drilling operation without endangering the tool through overheating.

Another advantage of the Super-Kool is that it prevents chips from accumulating at the cutting edge, the chips being automatically cleared away by the pressure of the oil which forces them out through the flutes.

Because of its sturdiness and its method of providing constant lubrication at the cutting edge, the Super-Kool has a life two to three times that of ordinary drills. By retaining its sharpness much longer, it also results in smoother holes.

PROMPT SHIPMENT

All sizes from ⅜" to 3½" in diameter and up to 36" overall

DETROIT REAMER & TOOL CO.

2830 E. 7-Mile Road Detroit 12, Mich.

Manufacturers of

Oil Hole Drills . . . . . Special Reamers
Circularity Relieved Reamers and End Mills

Also

Special Tools

SUPER KOOL

OIL-HOLE DRILL

BOTTLENECKS
DAMN THE TORPEDOES
FULL SPEED AHEAD!

Making only Mounted Wheels and small Grinding Wheels—maintaining highest quality in spite of large quantities and rush orders—shipping them promptly—this is our job, our battlefield.

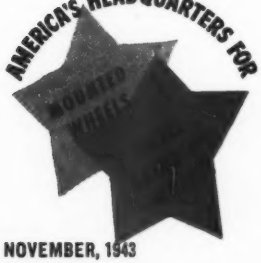
With full WPB approval, we stopped making all large size grinding wheels and fixed our sights on wheels *3" in diameter and under.*

We worked all around the clock, 24 hours a day, and in a short time were able to fill orders on time—And, our central location cuts time in transit. Today, there is no waiting. With the Army-Navy E at our masthead, we are going full speed ahead.

Half a century of specialization has established our reputation as the Small Wheel People of the Abrasive Industry. You can bank on us.

TEST WHEEL FREE—
To get acquainted with Chicago Wheels, let us send one postpaid. Tell us size wheel and material you wish to grind.

Write for illustrated catalog



CHICAGO WHEEL & MFG. CO.

1101 West Monroe Street, Dept. TD, Chicago 7, Illinois

TD-11

Send Catalog. Interested in:
☐ Mounted Wheels ☐ Grinding Wheels
☐ Send Test Wheel. Size.....

Name .....
Address .....

CONSIDER

THE MACHINING OF A PART LIKE THIS!

SUPPOSE you had a contract to turn out thousands of the highly eccentric spool-like cams pictured here. Consider the work—the man-hours, the expense — of producing them unit by unit. What would your per unit cost soar to? How many rejects would you have to expect? What about the time element? What would happen to your production schedule?

The manufacturer of this cam eliminated those questions by ***Turning to Turchan,*** the all-hydraulic duplicator. A Turchan Follower, attached to a standard type lathe, proved to be the perfect answer to his problem. They are now produced about 20 times faster than was possible previously.

You, too, can ***Turn to Turchan*** and save time, money and reject worries.

Turchan Followers attach easily to any standard type lathe, planer, shaper, grinder or mill. They do not interfere with normal use of the machine and what is just as important, they fit equipment you now have in your plant. You do not have to purchase new and expensive machine tools to use a Turchan Follower.

Turchan Followers, made for one, two or three dimensional work, are tops when it comes to die sinking or any other eccentric contour job. Write today for our new illustrated booklet.

TURN TO *Turchan* **FOLLOWER MACHINE CO.**

Originators of Hydraulic Duplicating Attachments

8259 Livernois Avenue Detroit 4, Michigan

SEVERANCE TOOLS ON STATIONARY SET-UP SPEED FINISHING OF SMALL PARTS

Above you see a Severance Midget Milling Cutter being used in a stationary set-up which many manufacturers of small parts have found to be a great time saver. The part is held in the hand, the tool is held in a chuck on almost any type of bench lathe, polishing unit or flexible shaft mounted in a vise.

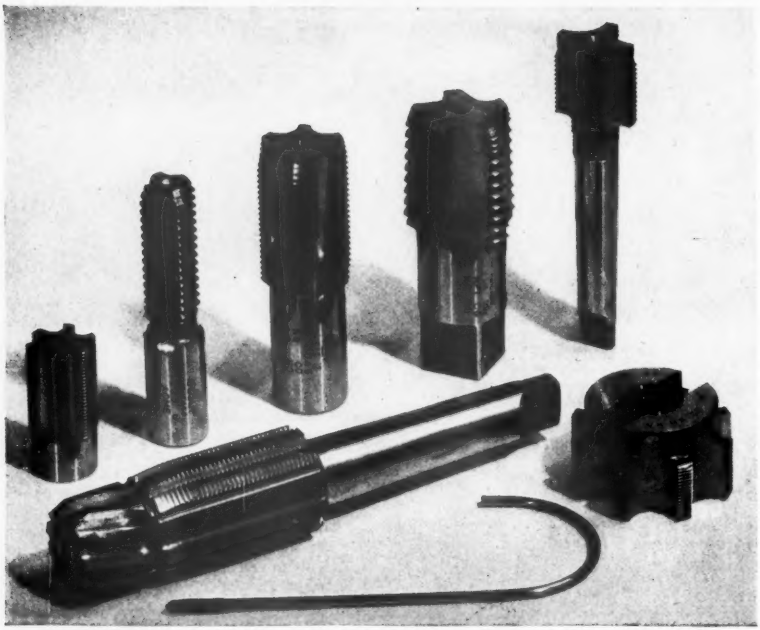
No matter how they are used, Severance Midget Milling cutters do the job of finishing faster and cleaner than any other type of rotary tool. They take deep, sharp bites and can be successfully reground scores of times. Write for complete facts on how Severance High Speed Steel and "Carbide" Midget Milling Cutters can help you speed up your cleaning and finishing operations.

Severance

SEVERANCE TOOL INDUSTRIES, INC.
Saginaw, Mich. Plants in Long Island City, N.Y., Detroit, Mich., Fort Wayne, Ind., Chicago, Ill., and Los Angeles, Cal.

BESLY

TAPS ARE TOPS



Besly Taps are good Taps. Every step of our manufacturing process is closely watched to the end that taps bearing the name "Besly" do perform as they should. When you think of tapping remember Besly Taps are "tops".

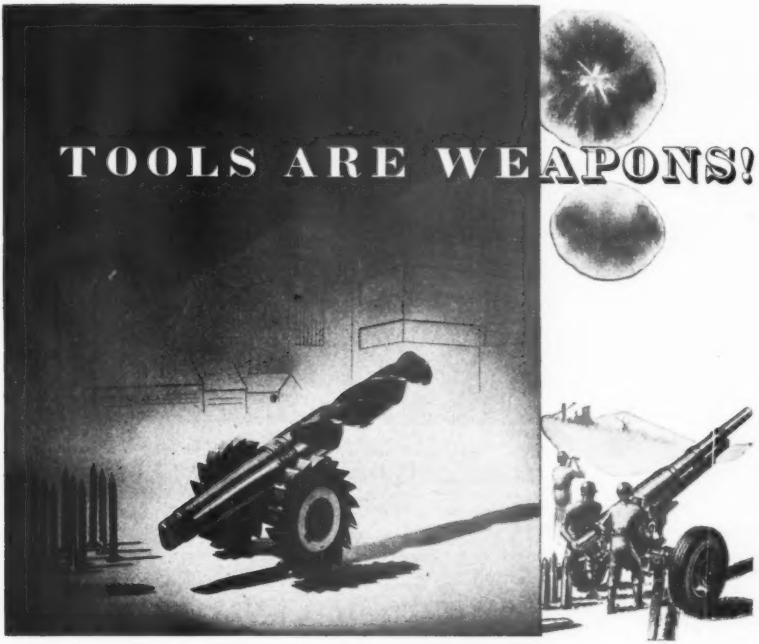
Send for CATALOG No. 67

It has a wealth of useful information for Tap users

CHARLES H. BESLY & COMPANY

118-124 NORTH CLINTON ST., CHICAGO, ILLINOIS

FACTORY: BELOIT, WISCONSIN



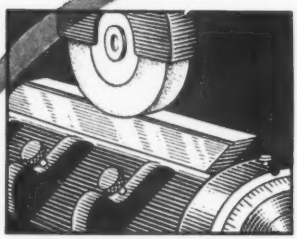
NATIONAL cutting tools are *fighting* tools. They are built to take it—to stand up when the production pace is pressing.

Even the toughest tools produce more work with proper care. That's why the craftsmen who make National tools ask you to sharpen them regularly, be generous with the coolant. Work them hard but work them right!

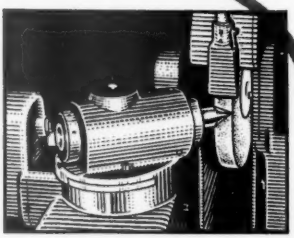
NATIONAL

TWIST DRILL AND TOOL COMPANY

HOW TO *Recondition* GRINDING



Blades—Sintered carbide and high speed steel blades have remarkable wearing qualities and must be ground carefully because they are very resistant to grinding wheels. During regrinding the wheel becomes dull quickly, and dull wheels check the blade. With the proper precautions, however, a blade can be reground to its original accuracy. Use the correct wheel for blade material; take light cuts (.0005" for h. s. s. and .0002" for the carbides); dress the wheel often; when grinding blades on a surface grinder, flood with coolant. If you use a cutter grinder, be sure to grind dry.



Centers—Worn centers can readily be reground to their original accuracy. High speed steel and tool steel center points may be reground on a plain center-type grinder with the aid of a center grinding fixture; on a universal grinder, with the heads set. Use a soft wheel, (grade M2 Aluminum Oxide, 60 to 80 grain) even though it means changing the wheel already on the machine. Be sure to flood with coolant, *before* the center contacts the wheel. Sintered carbide centers may be reground on a cutter grinder using wheels recommended for the type material. In either case, take very light cuts (.0002"). Run the center at a high speed. These precautions will prevent "checking" and give your centers many more productive hours.

CINCINNATI

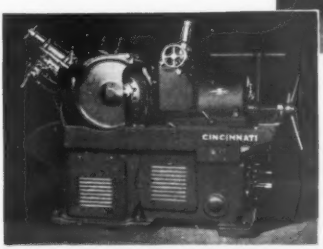
TOOL ROOM AND MANUFACTURING MILLING MACHINES . . . SURFACE BROACHING MACHINES . . . CUTTER SHARPENING

MACHINE CENTERS AND BLADES

• Some machine elements do no cutting but, nevertheless, are used up in the manufacturing process and must be classed as "consumable." Centers for centertype grinders and blades for centerless grinders are members of this group. Many of them are made of high speed steel or sintered carbide, both critical materials, and their conservation is just as important as milling cutters, hobs, form tools, etc.

It's not difficult to grind blades and centers. Follow the few fundamental principles outlined at the left, and your blades and centers will be good for a much greater volume of production.

Right: CINCINNATI 12" Hydraulic Universal Grinding Machine. Complete engineering specifications may be obtained by writing for catalog No. G-486-1



Left: CINCINNATI No. 2 centerless Grinding Machine. Complete engineering specifications may be obtained by writing for Catalog No. G-456-1

MACHINES . . . CENTERTYPE GRINDING MACHINES . . . CENTERLESS GRINDING MACHINES . . . CENTERLESS LAPPING MACHINES

for THIS battle, G.H.Q. is at YOUR own desk!

★ Here's how you—yes, YOU—can carry out a smashing "pincer movement" against the Axis. Swing in on one flank with increased production of war goods! Drive in on the other with redoubled purchases of War Bonds through your Pay-Roll Savings Plan!

You're an officer in both of these drives. Your personal leadership is equally vital to both. But have you followed the progress of your Pay-Roll Savings Plan as closely as you have your production?

Do you know about the new Treasury Department quotas for the current Pay-Roll Allotment Drive? *Quotas running about 50% above the former figures?* You see, these new quotas are based on the fact that the armed forces need more money than ever to win the war, while the average worker has more money than ever before to spend. Particularly so, on a *family income* basis—since in so many families several members are working, now.

Remember, the bond charts of today are the sales curves of tomorrow! Not only will these War Bonds implement our victory—they'll guard against inflation, and they'll furnish billions of dollars of purchasing power to help American business re-establish itself in the markets of peace.

So get this new family income plan working at once. Your local War Finance Committee will give you all the details of the new plan. Act today!

This advertisement prepared under the auspices of the War Advertising Council and the U. S. Treasury Department.

LET'S KEEP ON Backing the Attack!

This Space is a Contribution to America's All-Out War Effort by

THE TOOL & DIE JOURNAL Staff

Maximum strength with a keen cutting edge, not an extremely thin edge that crumbles quickly, is one reason why MELIN End Mills *last longer.* This advantage is assured by clearing each cutting lip by the double back-off method. ★ **A smooth hard flute with the proper "hook rake" for fast, clean cutting and minimum heat generation** is one reason why MELIN End Mills *cut better* and *produce more.* This benefit is guaranteed by grinding and polishing the cutting edges and flutes so that all decarburized metal is removed from the working surface of the tool. ★ For unexcelled, uniform quality, specify MELIN End Mills.

● DISTRIBUTOR INQUIRIES INVITED

MELIN MILLS

DETROIT 2228 Bellevue Ave. GRAND RAPIDS 1331 Phillips, S.W.

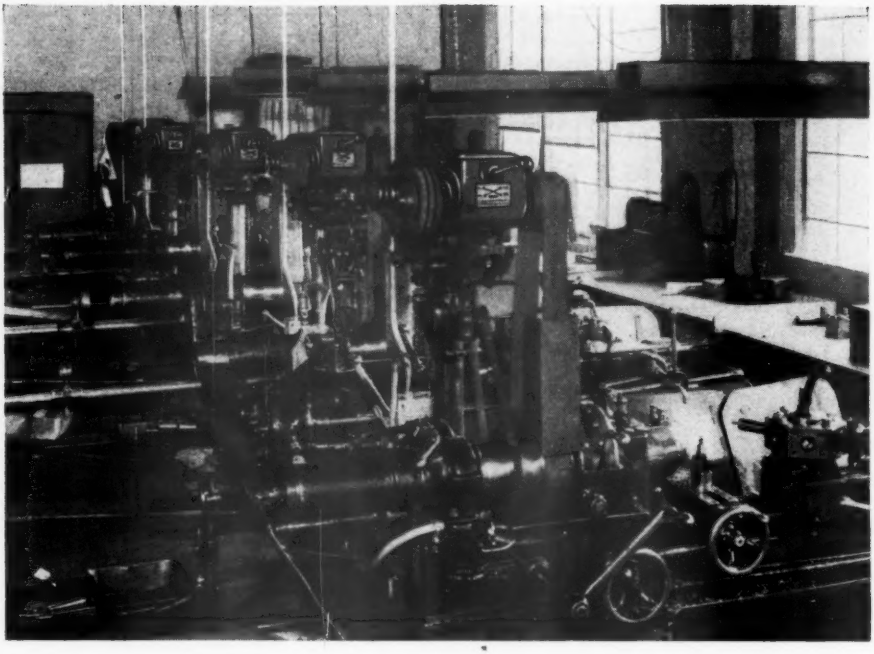
TWO NEW BOOKS YOU SHOULD HAVE

THE STRANGE CASE OF THE MURDERED END MILL
Tells how to correct Overheating, Chatter, Breakage, Slippage, etc.

NEW MELIN CATALOG No. 6
Gives complete prices and specifications on Standards. Inquiries on Specials receive prompt attention.

Melin Mills
2228 Bellevue Ave., Detroit 7, Mich.
Without obligation, please send me
☐ The Strange Case of the Murdered End Mill.
☐ New Catalog No. 6 and literature on MELIN Long-Life High-Speed END MILLS.

NAME.....TITLE.....
COMPANY.....
CITY.....STATE.....



Battery of turret lathes motorized with Western Transmissions in the modern plant of Scully-Jones and Company, Chicago, U. S. A. — Photograph the courtesy of Scully-Jones and Company.

. . . as many as 350 in one plant

Hundreds of plants throughout the country motorize their machine tools with Western Transmissions . . . one Detroit plant has more than three hundred and fifty turret lathes so equipped.

The Western MASTER (1-5 h.p.) transmission including standard bracket f.o.b., Detroit **$95.00**

The Western MAJOR (5-10 h.p.) transmission including standard bracket f.o.b., Detroit **$145.00**

Western SUPER (up to 30 h.p.) with 8 SPEED CHANGES in Geometric Progression of 1.29 (total reduction of 6 to 1) . . . For Machine Tools, Rubber Mills, Steel Mills, Baking Machinery, etc.

Services of our engineering department are at your disposal . . . Send for new four-page catalog. Prompt deliveries on high priorities.

up to 30 h. p.

For Motorizing Lathes, Milling Machines, Shapers, Turret Lathes, Radial Drills, Slotters, Bolt Cutters, Gear Cutters, Die Sinkers, Boring Mills, etc.

WESTERN TRANSMISSIONS

WESTERN MANUFACTURING CO. — 3400 SCOTTEN — DETROIT, MICHIGAN

even spilled milk is good for something!

Your tool and die failures need not be a total loss. Now that you know what you don't need, let us suggest a solution for many of these problems.

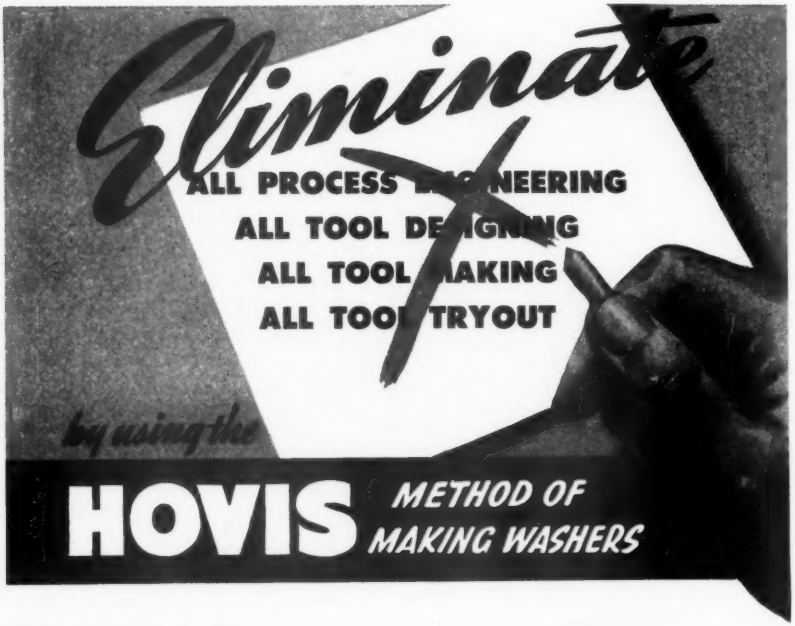
If you have made the mistake of using a tool steel that is tough to machine, investigate Graphitic Steels. Their easy machinability resembles that of cast iron. If your dies and tools are subject to terrific abrasion and are wearing out faster than you think they should, ask about Graphitic Steels' wearing qualities. If you are having trouble with distortion in the thin sections of your dies, these same steels will solve your problems.

Ask for your copy of the new Graphitic Booklet which gives complete technical and performance data. The Timken Roller Bearing Company Canton, Ohio. Steel and Tube Division.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

GRAPHITIC STEELS



HOVIS UNIVERSAL MASTER WASHER DIES offer you tremendous advantages. By this simplified method of making washers, you first make a moderate investment in Master Washer Dies of the sizes to fit your needs. Then all you need to buy is five small, interchangeable parts to make any size washer. Hovis Master Dies are made on an all-steel precision die set, complete with gauges and stops. The five interchangeable parts can be removed without dismantling the die. You save on materials, storage space, labor costs and time. And you can make washers on short notice—no costly delays—no necessity to keep large inventories on hand.

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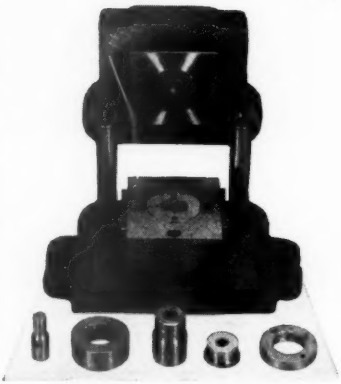


Made in 4 sizes;
¾"—1½"—2½"—4".

HOVIS SCREWLOCK COMPANY

8100 E. NINE MILE ROAD — VAN DYKE, MICHIGAN
Suburb of Detroit Phone: Centerline 1575

▼

IF YOU HAVE A

South Bend, Atlas, Logan or Sheldon

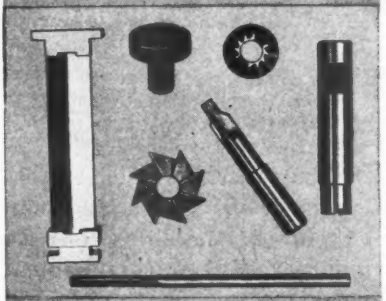
BENCH LATHE

▼

YOU *CAN* HAVE AN

Economical, Time-Saving

MILLING MACHINE



SAMPLES OF WORK

The "Thompson" fixture is efficiently used for milling punches, end mills, key ways, counter bores, or manufacture of duplicate parts.

Merely by Adding This

Thompson

UNIVERSAL MILLING FIXTURE

Turns out indexed work, fast, with no chance of error. Vise and universal slide base can be used without index fixture for straight or angular milling.

Write for information folder.

ARMY E NAVY

Awarded to Auto-Ordnance Corporation for excellence in production of "Tommy" Guns.

AUTO-ORDNANCE *Corporation*

THOMPSON TOOL DIVISION

342 West Putnam Avenue, Greenwich, Conn.

•

GREENWICH • STAMFORD • BRIDGEPORT • NEW YORK

Sav-way Announces—

A NEW SET OF MASTER SETTING AND CHECKING ROLLS

A Really Accurate Method for Checking Micrometers and Other Precision Inspection Devices

Your precision tools and inspection devices are only as accurate as the methods and gages by which they are set and checked. When anvils are worn unevenly, flat gage blocks are not adequate. This Sav-Way Set of Master Setting and Checking Rolls provides for the first time a really accurate means of checking micrometers, snap-gages, amplifiers, and dial indicators under all conditions of wear. The set consists of 20 rolls ranging from .100" to 2.000" in diameter. Rolls are hardened, ground, and lapped to X gage tolerance. The set is housed in a modern transparent plastic case.

Send the Coupon for Illustrated Circular and Price

Sav-way INDUSTRIES
Products Division
4875 EAST 8-MILE ROAD • DETROIT

SAV-WAY INDUSTRIES
Box 117, Harper Station, Detroit 13, Michigan

Please send complete description and price of Sav-Way Master Setting and Checking Rolls.

Name _____

Firm _____

Address _____

City _____

ANODIZING by Advance

Anodizing produces a coating which is applied electrolytically to aluminum and aluminum alloys. In War or Peace, anodizing safeguards men and machines and provides . . .

- *Maximum protection against corrosion.*
- *Compliance with Army-Navy specifications AN-QQ-A-696-a.*
- *An excellent base for paint adhesion.*
- *An insulating coating which will not conduct electricity.*
- *A hard coating which resists abrasion.*

The Advance Plating Company is prepared to supply you with a complete, modern, *and fast* anodizing service. Five large units operate 24 hours a day. "Still" tanks handle forgings, extrusions, castings, stampings and machined parts in all shapes and sizes up to 14 feet long. For low-cost processing of small parts—rivets, washers, screws, nuts, and machine screw parts—the "basket" (bulk) method of anodizing is available. Modern equipment, experienced personnel, and complete technical control insure perfect workmanship.

APCO is the sign of Quality . . . but Quality *and Service* go together at Advance! If you need parts in a hurry, Advance will get them out quickly . . . within a matter of hours if necessary . . . and our research and development department is always ready to help you solve your difficult finishing problems. Write, wire, or 'phone for an Advance engineer to visit your plant and talk over your requirements.

ATTENTION POSTWAR PLANNERS!

Are you planning to use aluminum in postwar conversion? It is light, strong and durable. An Advance engineer can assist you in providing an attractive finish.

THE *Advance* PLATING COMPANY

1947 W. 28th Street • CLEVELAND 13, OHIO • Tel. WOodbine 9090

APCO

Save time on metal cutting..

IN
PRODUCTION
STORES
TOOLROOM
MAINTENANCE

LLS No. 8
Capacity
8"x16", Rectangular
8" diameter, Round

. . . with a **WELLS** No. 8 metal cutting band saw

THE Wells No. 8 is an all-purpose metal cutting saw, fast for a saw of its size. It can be used on production, in stores, toolroom, or on maintenance to cut most metals in most shapes. Easily portable it can be moved to the job.

The Wells No. 8 cuts fast because it cuts continuously. Quick acting swivel vise affords rapid set-up and change-over . . . Gravity feed and automatic motor shut-off permit one operator to run 2 to 4 Wells band saws simultaneously . . . Three speeds, insure efficient cutting.

Ruggedly constructed, with a minimum of moving parts, Wells No. 8 offers a long life of trouble-free service. You will find a Wells saw to suit nearly every application. Ask your mill supply dealer to give you a demonstration. Quick deliveries are assured.

Write for your copy of the
NEW WELLS CATALOG

WELLS MANUFACTURING CORPORATION

Wells METAL CUTTING BAND SAWS

1940 ASH STREET ★ THREE RIVERS, MICHIGAN

Special
HIGH SPEED STEEL
CUTTING TOOLS
A mature all inclusive organization devoted to the designing and manufacture of special form, milling and all types of metal working tools . . . Right here in the home of high speed precision production, we have kept pace, and anticipated many of the requirements of this kind of tooling . . . Send for new sixty page catalog.
U.S. TOOL CO. INC.
6906 KINGSLEY - DEARBORN, MICHIGAN
Established in nineteen hundred and thirt

Ready Now FOR YOUR *Super* CUTTING JOBS ...*Super DBL* HIGH SPEED STEEL

ALLEGHENY LUDLUM mill technicians developed this new High Speed Steel to fill a dual role: first, to meet government requirements for the conservation of strategic materials; and second, to give you a higher degree of hardness and cutting stamina than has been previously available in steels which meet the conservation need.

Super DBL (a low-tungsten, molybdenum, cobalt steel) has been thoroughly tried and tested in service—it's ready to take on your heaviest-duty production work. Use it on hard, gritty castings—on heat treated alloy or stainless steels—on any rough and tough cutting job in the shop with full assurance of maximum red hardness and performance. ● For full data on properties, treatment and use, write for the *"Super DBL* Blue Sheet."

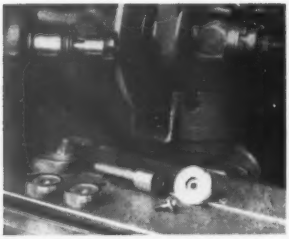
NO COMPLICATIONS IN HEAT TREATMENT OR HANDLING

For any shop man familiar with the techniques used on tungsten cobalt steels, or on the 18-4-1 and tungsten-moly analyses, there will be nothing new in the handling and treatment of *Super DBL*. It also conforms to standard in the forms and finishes available, which include regular sizes of mill-treated tool bits and can be supplied from Allegheny Ludlum warehouse stocks, as well as distributors, in principal cities coast to coast.

ADDRESS DEPT. TD-6

Allegheny Ludlum
STEEL CORPORATION
BRACKENRIDGE, PENNSYLVANIA

A-9074A . . . W. & D



HERE'S HOW TO DO IT and use grinding wheels wisely, too!

TO keep war production up to quota, industry needs tools, lots of them—and lots of grinding wheels to keep them sharp. There's enough steel and abrasives to do the job—but only if every man on a grinding wheel uses the proper procedure in sharpening tools. Otherwise precious steel is wasted, and grinding wheels are used up too fast. Here are a few rules to remember that will help you "treat 'em right."

Use the correct wheel for the job. It is essential that the correct grain type and size, structure and grade and the proper bond be used. The Carborundum Representative will be glad to help make your selection.

Keep grinding wheels sharp. Dress frequently with the proper dressing tool.

Sharpen tools frequently. Don't wait until they are very dull. You may waste tool steel by taking off too much stock and lose production. Sharpen them after a specific number of cuts—even if they don't seem to need it.

Control tool form. Proper tool performance can only be obtained by maintaining correct rake and clearance.

Use light grinding pressures. You may burn the tools. Edges may become soft from overheating.

Use the right equipment. Use only machines for reconditioning tools which are designed for the job.

CARBORUNDUM
REG. U. S. PAT. OFF.
ABRASIVE PRODUCTS

Every hour this war is shortened will save $12,000,000. The lives it will save are priceless. Let's get it over with—quickly.

THE CARBORUNDUM COMPANY, NIAGARA FALLS, N. Y.

MANUFACTURERS OF GRINDING WHEELS, COATED ABRASIVES, SUPER REFRACTORIES, HEATING ELEMENTS

Sales Offices and Warehouses in New York, Chicago, Philadelphia, Detroit, Cleveland, Boston, Pittsburgh, Cincinnati, Grand Rapids

(Carborundum is a registered trade-mark of and indicates manufacture by The Carborundum Company)

Critical Broach Saved

by "HARDSTEEL" DRILL—

When a tool that has cost hundreds of dollars and will take weeks or months to replace breaks, it is nothing short of a calamity. Production stops. One operation down may stop an entire production line.

The big broach illustrated broke through the slot in use. It was full high speed steel, yet with "HARDSTEEL" Drills it was possible to drill three ½-inch holes through the shank and put the broach back into service with very little delay. A new broach would have been months in the making.

Keep an assortment of "HARDSTEEL" Drills in your shop. You never know when they will save you time and money—whenever steel hardened to Rockwell "C" 40 or higher by any process must be drilled.

Fine for salvage operations—equally good for production operations where full hardened steel parts can easily be drilled to match at assembly.

Write today for your copy of the "HARDSTEEL" Operator's Manual.

BLACK DRILL CO. • 1400 E. 222nd St., Cleveland 17, O.

"You Harden It... We'll Drill It"

"HARDSTEEL"

DRILLS · REAMERS · TOOL BITS · SPECIAL TOOLS

THE CINCINNATI SHAPER CO.

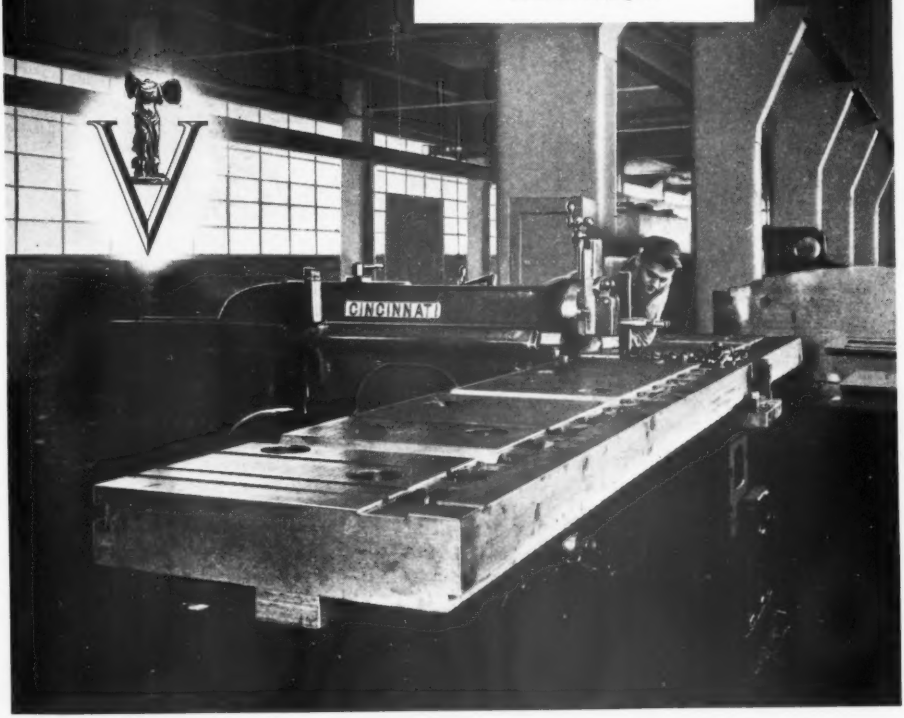
CINCINNATI OHIO U.S.A.

SHAPERS BRAKES SHEARS

Shaping a 10,000 lb. Plate

The Shaper is recognized as indispensable in the toolroom—but many manufacturing jobs are best performed on Shapers. Whether shaping slots in a 10,000-lb. plate or contouring small parts, the power and accuracy of Cincinnati Shapers will meet your requirements.

Write for Calalog N-2



● You can't fool a micrometer! Your "mike" will prove the longer cutting life of TECO Cemented Carbide because you hold accurate tolerances for longer runs—produce more pieces between grinds.

Rigidly controlled in manufacture, TECO Cemented Carbide is harder, denser, more uniform in structure—therefore more resistant to wear and breakage in high-speed turning, boring and facing of the toughest metals.

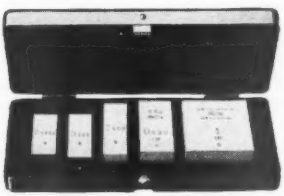
Increase your output per machine with TECO Cemented Carbide. Available in tools and blanks, in grades, styles and sizes for practically every machining need. Write for detailed catalog.

TUNGSTEN ELECTRIC CORPORATION 574 39th Street, Union City, N. J.
Branch Office: 2906 Euclid Avenue, Cleveland, Ohio
Representative: Architects & Builders Bldg., Indianapolis, Ind.

TECO *Pioneers in Tungsten Carbides for over a Quarter Century* **CEMENTED CARBIDE**

MEASURING THE INVISIBLE

THE accuracy of Johansson Gage Blocks is within millionths of an inch—the world's highest standard of precision measurement—a limit much finer than a human hair and invisible to the naked eye. For today's close limits on machined products, Johansson Blocks provide the means to regage your shop for extreme precision at minimum expense. They're priced as low as $23.00 for sets and $3.50 for individual blocks. For full details, prices and lists of accessories write for free catalog.



JOHANSSON GAGE BLOCKS
AND ACCESSORIES

Ford Motor Company, Johansson Div.
Dept. TD-11 Dearborn, Michigan

THIS PERFEX DRESSER SAVES ME TIME ON "SET-UPS"
GUARANTEE:
All working parts (worn out by natural wear) are guaranteed for 5 years.

Your operators will agree once they use this Perfex Angle Tangent to Radius Dresser, that it not only saves on set-up time but has many other advantages over the ordinary type dresser.

★ *Advantages* ★

in using PERFEX DRESSER on YOUR job

1. Radius can be set accurately to within .0001.
2. It is possible to return the diamond to center after dressing an angle within .00005.
3. It is possible to dress a smaller than .050 radius to a full half circle without additional attachments.
4. The Perfex Dresser dresses in horizontal position exactly in the plane in which the work will be ground.
5. The vernier is very legible, and can be easily read from normal position.
6. All moving parts made from hardest steel ground and lapped to a perfect fit.
7. All surfaces protected from rust.

DELIVERY Quick delivery can be made with necessary priorities. Write for descriptive literature and prices today.

PERFEX DRESSER CORPORATION
3607 GAYLORD . DETROIT, MICHIGAN

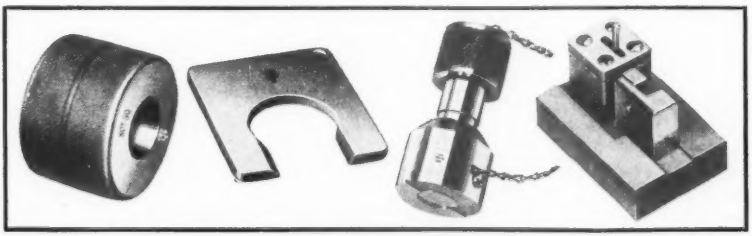
RUSH DELIVERIES can be made on TURNER STANDARD STEEL *Plug* GAUGES!

Now your rush orders on Turner's standard steel plug gauges can be delivered within a few days—that's how Turner has stepped up their production to meet your demands for faster delivery. And here is how to order them by giving us the following information: 1. Diameter; 2. Length of gauging surfaces; 3. Tolerance or accuracy; 4. Hardened alloy steel or chrome; 5. Number of members—Go, Not Go, Handles; 6. Complete marking instructions.

33⅓% discount off list prices!

Prompt delivery can be made on rings, snaps, flush pins and built-up gauges too. For the latest delivery dates write us today.

FAST DELIVERIES ON THESE TOO!



Wire your order today

or PHONE DETROIT, ELMHURST-6969

TURNER BROTHERS

TURNER GAUGE GRINDING COMPANY

2624 HILTON ROAD • • • • FERNDALE, MICH.

Speed up Gaging in your plant

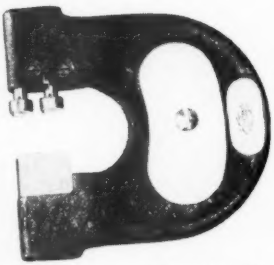
with "Quality" Adjustable Limit SNAP GAGES

A. G. D. MIDGET Adjustable Limit Snap Gage

(With Round or Square Head Gaging Buttons)

Quality A.G.D. Midget Snap Gages are designed for greater ease and speed in gaging small parts. Light in weight (approx. 3 oz.), sensitive and with small contact surfaces (diameter of gaging buttons and width of anvil ¼"), they are superior to heavier type gages for making measurements close to a shoulder or in close quarters.

Available in sizes from: .000 to .760

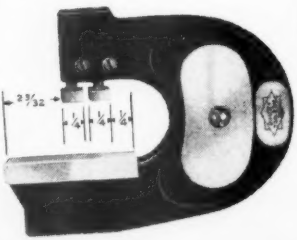


"KWIK-CHEK" MIDGET Adjustable Limit Snap Gage

(With Round or Square Head Gaging Buttons)

Odd and irregular shaped work may be easily and accurately checked with a Quality "Kwik-Chek" Midget Gage. Note the extension of the anvil which allows proper lining up of work before presenting it to the gaging buttons. Provides real speed-up of hand checking.

Available in sizes from: .000 to .760



KEEP ON BUYING WAR BONDS!

ARMY E NAVY

Write for Illustrated Price List

Quality TOOL & DIE CO.

N. Noble & E. Vermont, Indianapolis 2, Indiana

MANUFACTURERS OF "QUALITY PRODUCTS"

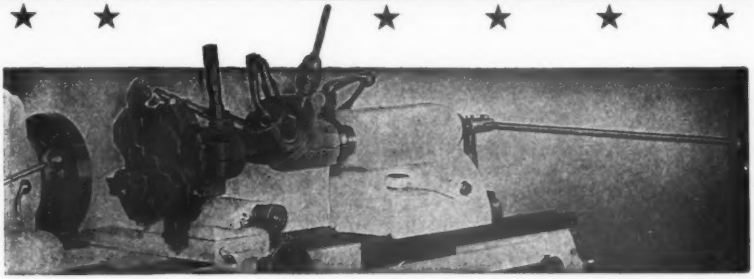
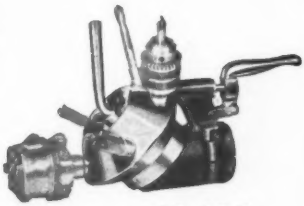


Photo above shows Jefferson Turrets on 16" lathe

CONVERT YOUR ENGINE LATHE INTO A TURRET LATHE IN 15 SECONDS



5-Tool Tail-Stock Turret

Jefferson Bull Dog Precision Milling Machine
IMMEDIATE DELIVERY

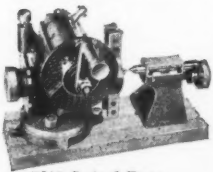
Yes, it's as easy as that! You simply attach the Jefferson Tail-Stock Turret, the Jefferson Tool-Post Turret, and the Jefferson Adjustable Pull Feed to your lathes as shown in illustration, above.

The productive capacity of these machines will be more than doubled in many instances because there will be available at all times NINE DIFFERENT TOOLS.

With these three JEFFERSON time-saving devices attached to a lathe, any kind of work may be done, such as forming, roughing, boring, finishing, knurling, drilling, tapping, etc., without stopping the lathe, or changing tools. THE JEFFERSON TURRETS are made very substantial, rigid, accurate and in several sizes to fit small bench lathes up to 24" swing.

Pat. Pending

4-Tool Tool-Post Turret



7½" Swivel Base Dividing Head
IMMEDIATE DELIVERY

Jefferson Turrets are real production tools — substantial, rigid, accurate and adaptable to any size or make of engine lathes. They must not be confused with the small makeshift gadgets now on the market.

TURRET DELIVERIES IN 6 DAYS

Write for further details of these and other Jefferson time-saving machine tools and machinery.

JEFFERSON MACHINE TOOL CO.
210 N. Fourteenth St., Cincinnati, Ohio

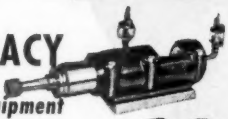
Tool-Post Turrets, Tail-Stock Turrets, Adjustable Pull Feeds, Belt Sanders, Gyratory Foundry Riddles, Overhead Swing Frame Grinders, Milling Machines, Dividing Heads and Vises.

WHEN IT COMES TO *Grinding* WITH ACCURACY

. . consider Ex-Cell-O precision equipment

Today's grinding practice brings Ex-Cell-O designed equipment right to the front. Ex-Cell-O precision-made products now entering for into the grinding field have made possible worthwhile improvements in methods to attain mass production with accuracy. There is the Ex-Cell-O thread grinder, introducing commercially a new precision process to American industry; the Ex-Cell-O tool grinder, bringing new efficiency in the grinding of cutting tools of carbide, stellite, and high speed steel; the Ex-Cell-O lapping machines for properly preparing female centers for grinding, and for the rapid precision finishing of small holes; and there is the Ex-Cell-O grinding spindle, widely used by the builders of internal, surface and universal grinding machines, for both original equipment and replacement. In the manufacture of all these products, only one standard exists at Ex-Cell-O—the best that highly trained engineers and skilled workers can produce. *If you have a grinding problem consider the equipment illustrated on these pages—the Ex-Cell-O name on each machine is positive assurance of it being a precision-built product to do a real precision job.*

Grinding on today's high and steady production basis places a heavy demand on the grinding spindle. It must be one that assures minimum end and radial play, as well as one that develops and maintains all the speed

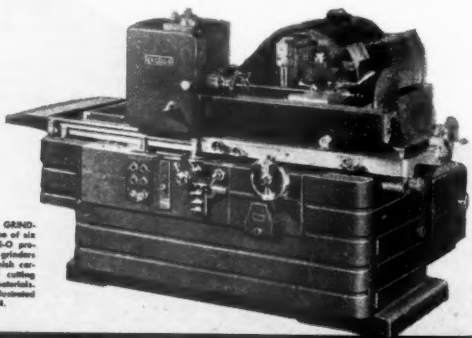


that's required for the job in hand, and accomplishes this for long periods of time without bearing adjustment or replacement. These are the exact features that have made the Ex-Cell-O spindle one of outstanding preference among machine tool builders. The greater accuracy, increased production, and better finish that a large number of industrial firms are obtaining today on machine tools equipped with the Ex-Cell-O Precision Spindle can, to a great extent, be attributed directly to the superior features of the Ex-Cell-O spindle ball bearing. These features include special methods developed and patented by Ex-Cell-O for precision fitting of the ball bearings.

PRECISION LAPPING MACHINES — (Above) Ex-Cell-O Style 74 for Center Lapping. With smooth, correctly shaped centers on workpieces, readily obtained through the use of this machine, greater precision can be assured when using grinding equipment. *To right:* Ex-Cell-O Style 71 internal Lapping machine for lower cost precision finishing of plain straight holes and holes with interrupted openings.

EX-CELL-O CORPORATION • DETROIT

PRECISION THREAD GRINDERS—Ex-Cell-O makes nine styles of precision thread grinding machines, making it possible for each manufacturer of hardened threaded parts to select the exact type of machine required to handle his precision threaded work successfully on a profitable production basis.



CARBIDE TOOL GRINDERS—(To left) One of six styles of Ex-Cell-O precision-built tool grinders designed to refinish carbide-tipped and cutting tools of other materials. The machine illustrated is Style 44.

XLO

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Precision THREAD GRINDING, BORING AND LAPPING MACHINES • TOOL GRINDERS • HYDRAULIC POWER UNITS • GRINDING SPINDLES • BROACHES • CONTINENTAL CUTTING TOOLS • DRILL JIG BUSHINGS • DIESEL FUEL INJECTION EQUIPMENT PURE-PAK CONTAINER MACHINES • R. R. PINS AND BUSHINGS • PRECISION PARTS

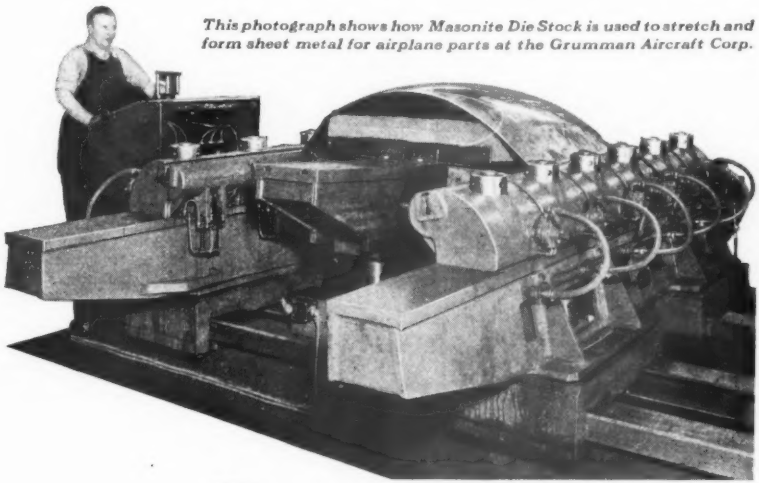
Another use for MASONITE* Die Stock

As America's amazing aircraft production soars to new highs, manufacturers find more and more uses for Masonite Die Stock.

Already widely employed to help shear and form airplane parts, this remarkable light-weight, semi-plastic material is now used for forms on stretching machines . . . permits easy handling of large forms . . . will not shrink, check or twist.

Other manufacturers, too, are saving time and money by using Masonite Die Stock for special types of mating dies, forming blocks, templates, jigs and fixtures.

Masonite Die Stock can be fabricated in pattern or metal shops with great speed . . . is available in thicknesses of ¼ to 2 inches . . . in sizes of 48 x 72 inches and 48 x 144 inches. For further details, please mail coupon below.



This photograph shows how Masonite Die Stock is used to stretch and form sheet metal for airplane parts at the Grumman Aircraft Corp.

*TRADE-MARK REG. U. S. PAT. OFF. "MASONITE" IDENTIFIES ALL PRODUCTS MARKETED BY MASONITE CORPORATION. COPYRIGHT 1943, MASONITE CORP.

MASONITE CORPORATION
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Please send me illustrative literature and complete information about Masonite Die Stock.

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Offhand you may not remember much of 1918 except that was the year the first world war ended.

The chances are that you won't remember that that was the year in which modern high speed steel broaching was born—with the founding of Colonial Broach Company.

25th colonial ANNIVERSARY 1918 1943

Few people cared—few realized the tremendous impact this new development would have on the future of metal working.

As a matter of fact it is our belief that few realize even today the place that broaching already occupies and will occupy in the near future—as the fastest and most accurate method of performing thousands of machining operations.

As a guide perhaps to the future, whether it be for war or for the peace to follow, Colonial has recorded in the Silver Anniversary issue of Broaching News the history of modern broaching development.

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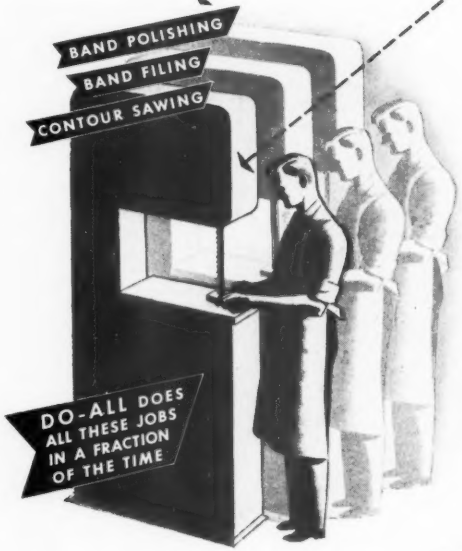

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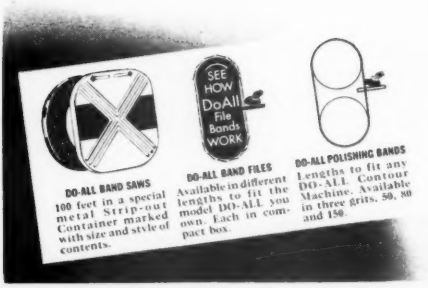
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DO-ALL Offices in 25 cities, with a staff of trained engineers to give you quick service on Contour Machines, Band Saws and Files, Gage Blocks and Surface Grinders.

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New England form tools, reamers, boring tools, centers, etc. are tipped with any make or grade of carbide specified by you; precision ground on diamond wheels; then checked and double checked on the latest type of contour inspection equipment. They are made to your specifications—exactly! Thus you can expect, and get, long life with highest accuracy. We will be pleased to arrange production schedules to supply your standard and special tooling requirements.

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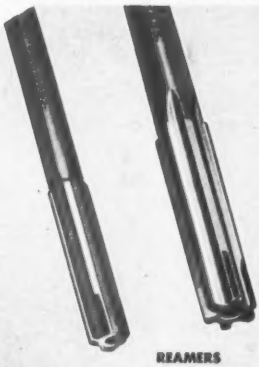
60 BROOKLINE STREET, CAMBRIDGE, MASS.



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FORM TOOLS

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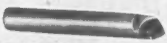

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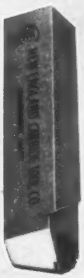

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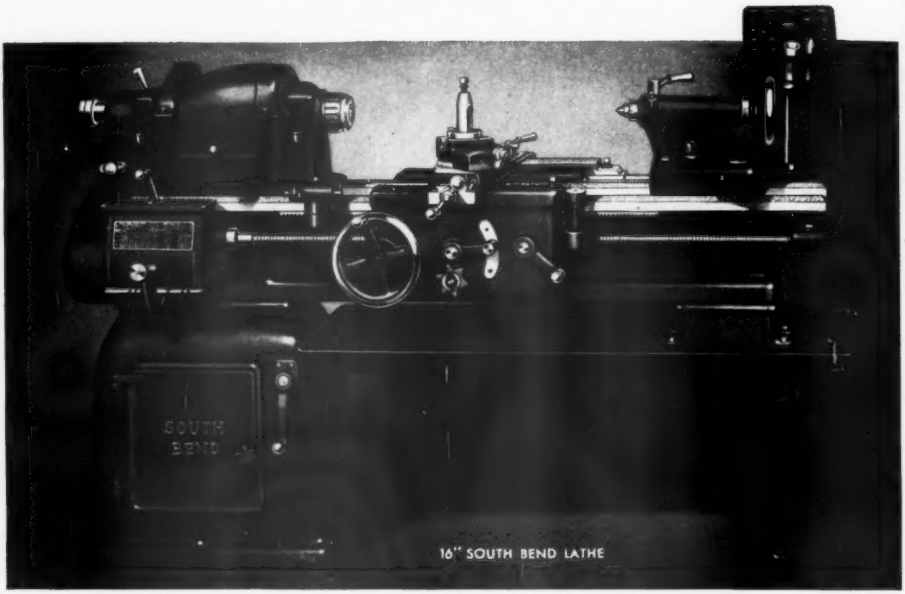

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SOUTH BEND LATHES

FOR UNIFORM ACCURACY

SPECIFICATIONS
of 16" lathe

Swing over bed	16¼"
Distance between centers	33½"
Maximum collet capacity	1"
Thread cutting feeds (48)	4 to 224 per inch
Spindle Speeds (8)	21 to 725 r.p.m.
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BUY WAR BONDS

War production demands uniform accuracy. Loss of time or the waste of scarce strategic materials because of variations in machining cannot be tolerated. There is no place in our war production plan for equipment that cannot be relied upon to maintain required tolerances.

Sound design and careful workmanship give South Bend Lathes the dependable precision that assures uniform accuracy and speeds production on the most exacting machine operations.

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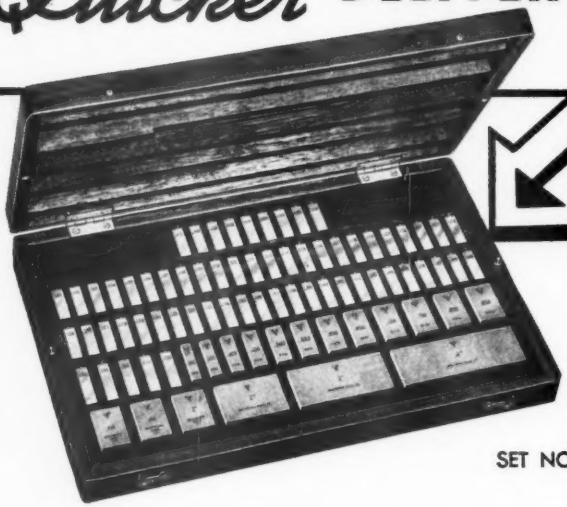

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The Dearborn Gage Company, Originators of Chromium Plated Gage Blocks are now in a position to make reasonably fast deliveries on all their standard gage block sets. This improvement in delivery is the result of Dearborn's increased production facilities during the past few months. If you need gage blocks in a hurry, wire or write us today for our latest delivery dates.

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Automatic Feed Riveting

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Designed to handle exclusively aircraft (aluminum alloy riveting) production... this new Air Powered RIVITOR averages 1600 riveted joints per hour... with no manual rivet handling. Combines Air Squeeze action with automatic feeding and setting. Soundly engineered... ruggedly built ...meets today's needs for *speed, accuracy* and *cost-cutting efficiency.*' Write for new catalog RP-1.

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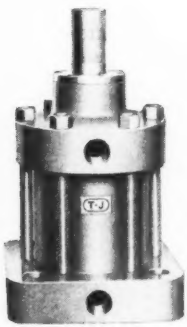

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They bring to these meetings expert knowledge gained through 20 years of experience in the development of equipment to assure rapid, efficient and economical production.

McKinney services vary with the needs and may entail—the designing of new tools, jigs and fixtures—building of equipment to customers' plans—plant layout and routing—recommendations for more resultful use of present equipment—or, advance plans covering post war production.

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CMD CENTER POINT LUBRICANTS Protect Tools Better

Because CMD Center Point Lubricants can withstand pressures greater than 50,000 pounds per square inch, they provide maximum protection for lathe centers, grinder centers, gages, screw machine cams and quills and other precision built tool parts. Try CMD Center Point Lubricants on your toughest job and see for yourself. Mail the coupon for generous free samples now.

The center shown above is the famous *CMD Helical Groove Center* which has a left-hand helical groove that conveys the oil constantly to the extreme point of the center.

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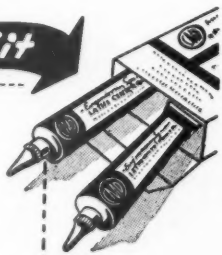
Write for **FREE** *Sample Kit*



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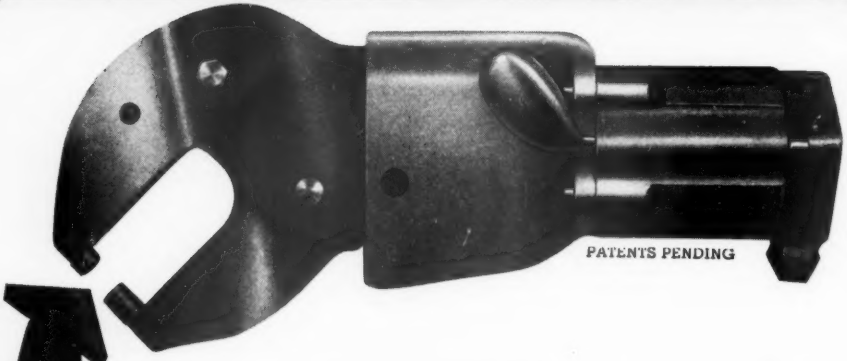
New CLECO 41-L Squeezer

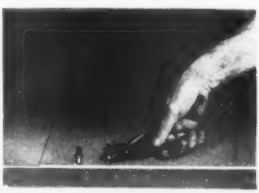


with parallel jaw action

THAT INSURES BETTER RIVETING

★ The faces of the riveter arm dolly and the anvil arm dolly of the Cleco 41-L Alligator Squeezer are *always parallel regardless of the amount of gap.* This exclusive feature prevents disalignment ("clinched rivets") and loss of rivets; it insures tight rivets with uniform heads, and does not cause distortion in the surrounding metal.

The 41-L is new in design, but is built to the same uncompromising quality standards that have distinguished Cleco Tools for so many years.



This squeezer is light and powerful; it weighs only 5½ lbs., is 12¼" long, and has a ⅛" rivet capacity. The working gap is $\frac{15}{16}$", with full opening of 1½". It is equipped with automatic return throttle, and adjustable pressure "pop-off," as well as return limit stop on alligator jaw.

To meet your wartime production schedule you can't afford to be without this unique squeezer. *Write now for complete information.*

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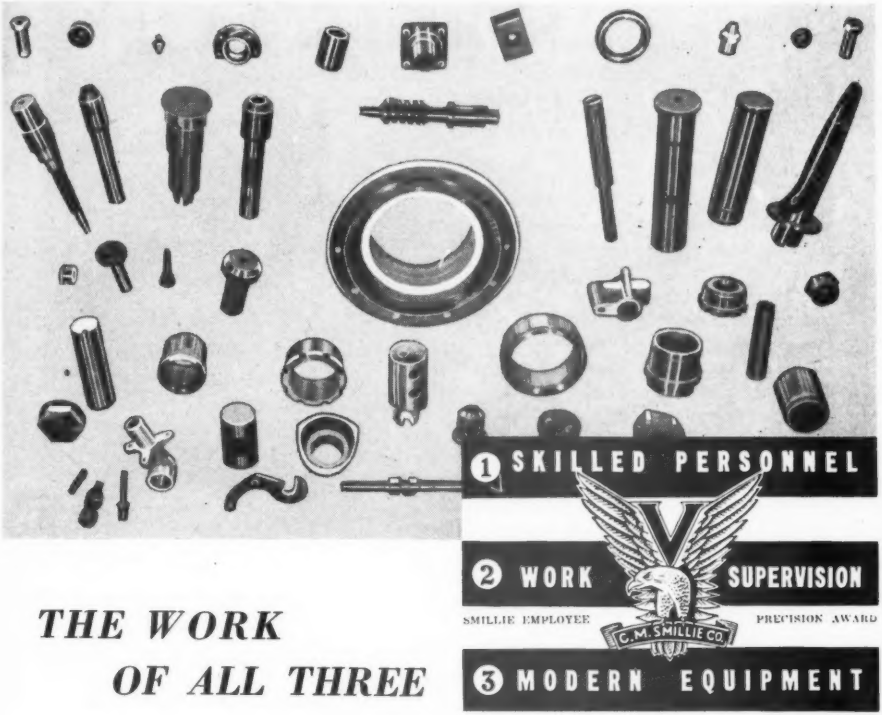

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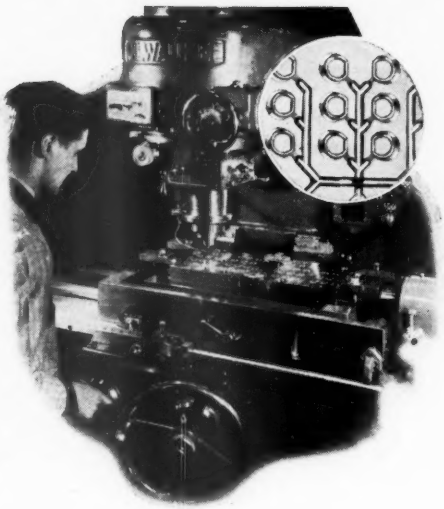
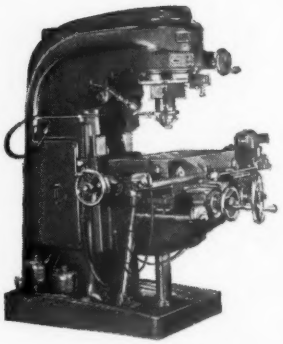
24 CAVITY MOLD FINISHED IN *18* HOURS!

Estimated time required by other methods was more than 100 hours!

THE two halves of the 24 cavity mold were aligned and properly spaced on The Milwaukee Rotary-Head Milling Machine table. The first milling operation was performed on the first cavity in the back row. Then, by moving the table the proper distance — the same operation was performed on the next cavity. Since the cavities in the two mold halves were identical, this and succeeding operations were simply carried over to the opposite half of the mold. Each operation was readily performed in proper sequence and the entire 48 impressions of the 24 cavity mold were machined completely at a single set-up in 18 hours.





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ROTARY HEAD MILLER

The Most Versatile Machine Ever Designed for Mold and Die Work

DIRECT . . . mills mold cavities in a single set-up without the aid of templets or models.

ACCURATE . . . chances for error are eliminated because there is no change in set-up. Exact control of all combinations of cutting movements — possible only with this machine — transmits mathematical precision to the work.

FAST . . . initial job preparation and set-up time is reduced to the minimum. Accurate performance of the machine saves operator's time and rapid production of intricate molds and dies is the result.

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Write for Bulletin No. 1002C for complete information on the Milwaukee Rotary-Head Miller and the accurate and rapid production of all types of molds and dies for plastics.

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Kearney & Trecker *Products*
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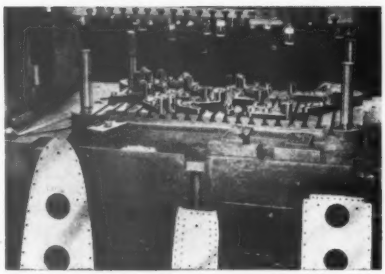
ADJUSTABLE DIES
SPEED WAR PRODUCTION

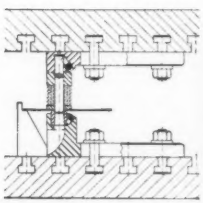
INCREASE HOURLY PRODUCTION—REDUCE "DOWN" TIME

Whistler adjustable die set-up for 12 foot power brake. These same punch and die units can be quickly rearranged for other patterns.

Whistler Adjustable dies are saving the day in war plant "speed-up" schedules by...saving weeks of time normally required in single purpose die making...units can be used over and over in different patterns...new set ups on or off the press in minutes ...all parts interchangeable...work on any type press...perfect precision on long or short runs...no special tools and new workers quickly learn to make press changes.



Another grouping of Whistler Adjustable Dies illustrating re-use of same units. Note close grouping of perforations.



Side view showing construction detail of U-50 Whistler Adjustable Punch and Die unit and typical example of perforated and notched piece produced by Whistler Dies.

Over 25 Years of Tool and Die Making Experience

S. B. WHISTLER & SONS, Inc.

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Every Production Executive needs this fully illustrated catalog. Sent upon request.

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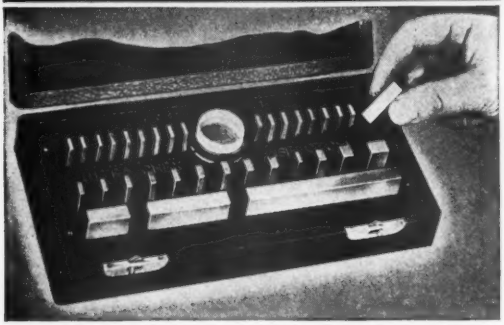


Gage Blocks Accurate to .000008"

Specialization in one 34 block unit enables us to offer the ULTRA-CHEX Inspectoset for $125.00 including optical flat for checking lapped surfaces.

Ultra-Chex are indispensable for precision manufacture. They provide a shop with an absolutely reliable system of size control, a necessity wherever definite limits of accuracy must be maintained. Hundreds of prime and sub-contractors now guarantee the accuracy of their output by using ULTRA-CHEX.

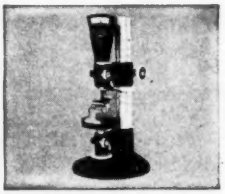
The 34 blocks in the Inspectoset are as follows:

.1001", .1002", .1003", .1004", .1005", .1006", .1007", .1008", .1009", .101", .102", .103", .104", .105", .106", .107", .108", .109", .110", .120", .130", .140", .150", .160", .170", .180", .190", .100", .200", .300", .500", 1.000", 2.000", 4.000".

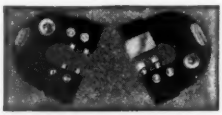
← *Checking lead accuracy of a micrometer with Ultra-Chex.*

Write for 8 page bulletin describing fully the many uses you will have for Ultra-Chex in your shop.

Request also folder on Reed Micrometers.



SCHERR COMPARITOL—for checking gage blocks, gages and work for size, accuracy and wear. $195.00



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SPENCER BINOCULARS — for detecting surface finish, imperfections, etc., by means of 3-dimensional vision. $143.50.

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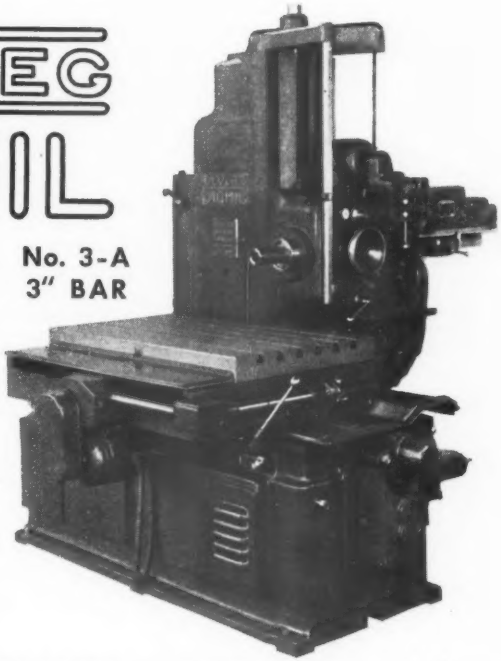

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THE CONVENIENCE AND FLEXIBILITY OF A HORIZONTAL BORING MILL

A PRECISION MACHINE

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NEW SPEED OF OPERATION

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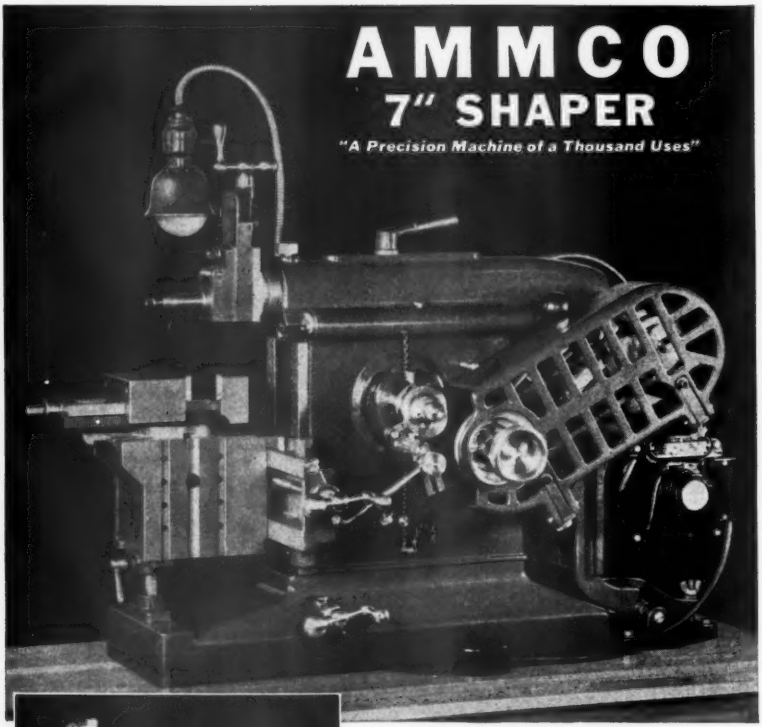
AMMCO
7" SHAPER
"A Precision Machine of a Thousand Uses"



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- **Just wheel up to bench--plug in--and go to work!**

On jobs requiring a stroke of 7" or less, the AMMCO 7" PRECISION SHAPER will enable you to save a lot of time and expense in a set-up which would be required for larger shapers. Furthermore, the AMMCO will enable you to get away from the cost of operating a big shaper on small work.

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$147.50

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Our Punch Presses Are More Flexible And Productive With WITTEK *Automatic* Roll Feeds And Reel Stands

Manufacturers of metal stampings facing problems in the feeding of coiled strip stock to punch presses will find that Wittek Automatic Roll Feeds and Reel Stands conserve man-hours and achieve new high production levels.

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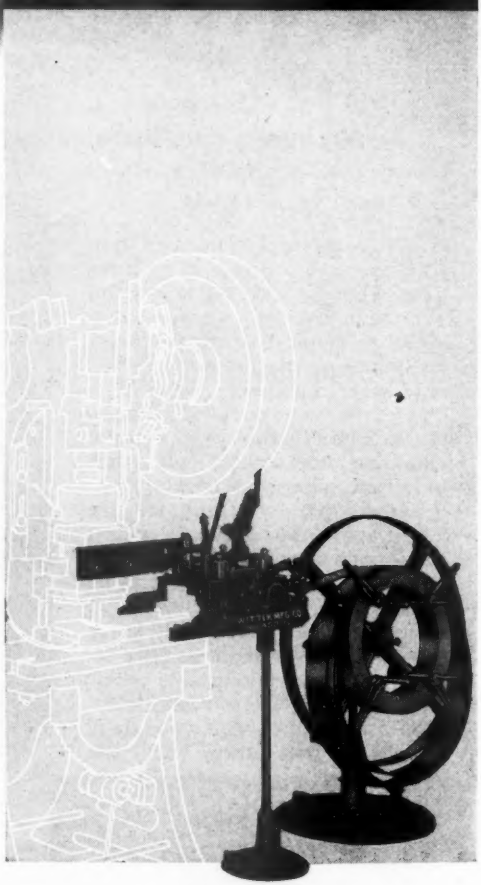

ARMY E NAVY

WITTEK WMCO *Automatic* ROLL FEEDS and REEL STANDS

For All Makes and Sizes of Punch Presses

Heat Treat Your Own Small Parts...

SAVE TIME AND MONEY THESE 5 DIFFERENT WAYS

This small compact electric furnace is inexpensive, handy and easy to operate—ideal for small tool and die shops—saves time these five different ways:

1 Eliminates delays in sending small machine parts out to overcrowded commercial heat treaters.

2 Saves time and expense of drawing or tempering small metal parts in large furnaces.

3 Cuts handling time when normalizing or annealing small parts. No waiting.

4 Conveniently available for pre-heating for subsequent high-speed hardening.

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**Includes Hearth Plate*

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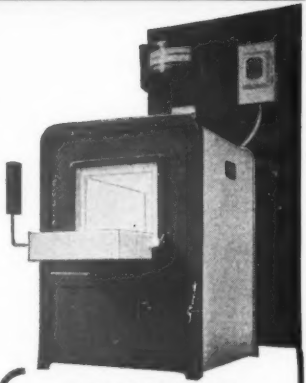

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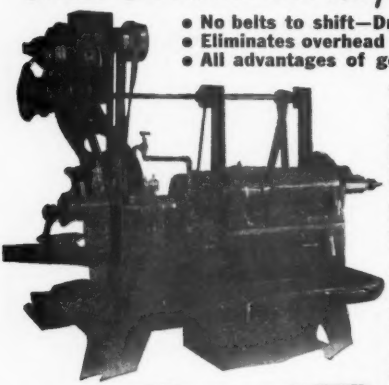

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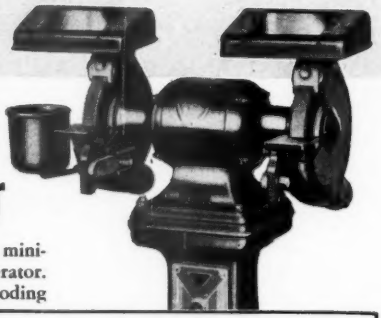

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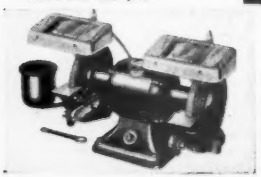

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America needs SCRAP

...BUT NOT *this* KIND!

These days the hungry mouths of America's blast furnaces can use every bit of scrap iron and steel they can get—and more. But they don't want good tool steel that has ended prematurely on the junk heap through carelessness and faulty grinding.

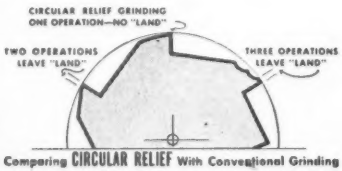
Now's the time to take a good critical look at your tool-sharpening operations. Are they modern, up-to-date? Do they conserve and protect the life of your precious tools?

Grind the CIRCULAR RELIEF way

SAVE TOOLS TO HELP SAVE AMERICA

CIRCULAR RELIEF GRINDING makes tools last longer because it sharpens efficiently without needlessly cutting away valuable metal. Moreover, tools are ground with *one machine*, in *one operation*—an operation so simple that inexperienced men can handle it.

Take a look at the diagram below for a comparison between CIRCULAR RELIEF GRINDING and conventional methods. Then send for our free folder telling the whole story. Do it *today*. Start conserving your precious tools *now!*



Comparing CIRCULAR RELIEF With Conventional Grinding

Note how CIRCULAR RELIEF GRINDING *follows the curve* of the tool, grinds right up to the cutting edge, and does not cut away valuable metal supporting the cutting edge.

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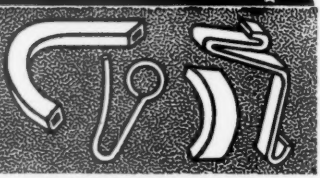
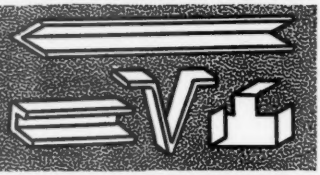
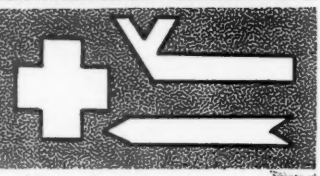
IF YOU BEND tubing, wire, channel, moulding, strip stock



OR FORM angles, channels, "vees", brackets, clips



OR TRIM stampings, strips or squares, make slits or notches



Do you need metal stampings or duplicated parts in a hurry? Quite probably you can make them without dies! DI-ACRO Precision Machines — Shears, Brakes, Benders—have a remarkably wide range of applications especially when 2 or more units are used in combination. In many cases they eliminate the need for dies entirely—and you have your stampings or parts in a few hours. All duplicated work accurate to .001". Put "DIE-LESS DUPLICATING" to work in your plant—it will solve many a knotty problem.

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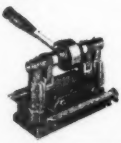
form non-stock angles, channels or "Vees". Right or left hand operation. Folding widths—No. 1—6". No. 2—12". No. 3—18".



DI-ACRO SHEARS
square and size material, cut strips, make slits or notches, trim duplicated stampings. Shearing widths—No. 1—6". No. 2—9". No. 3—12".

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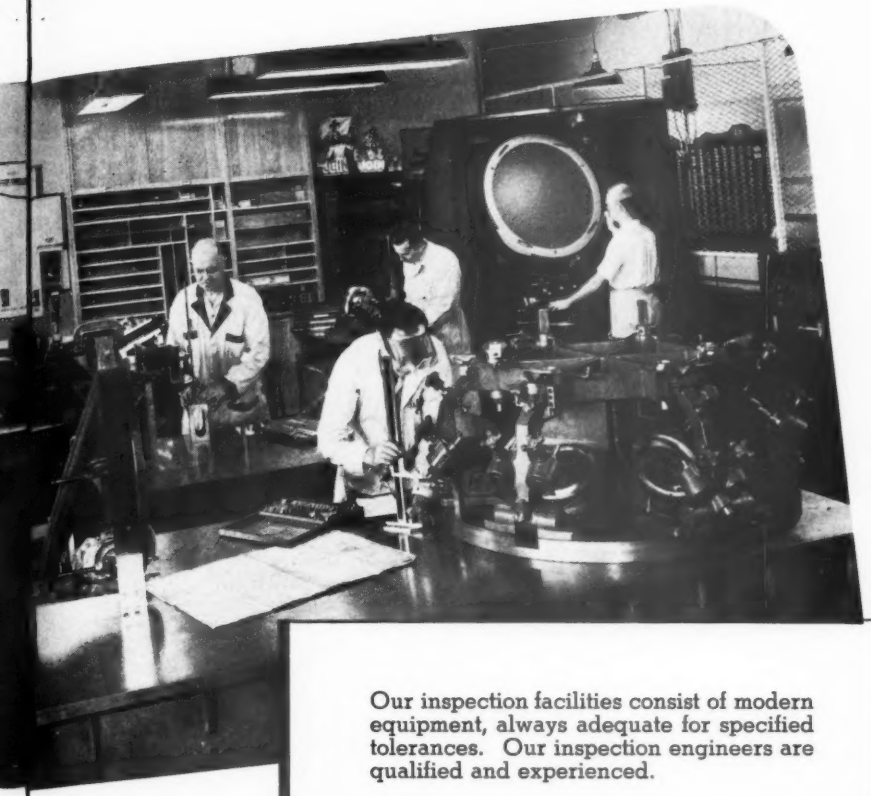

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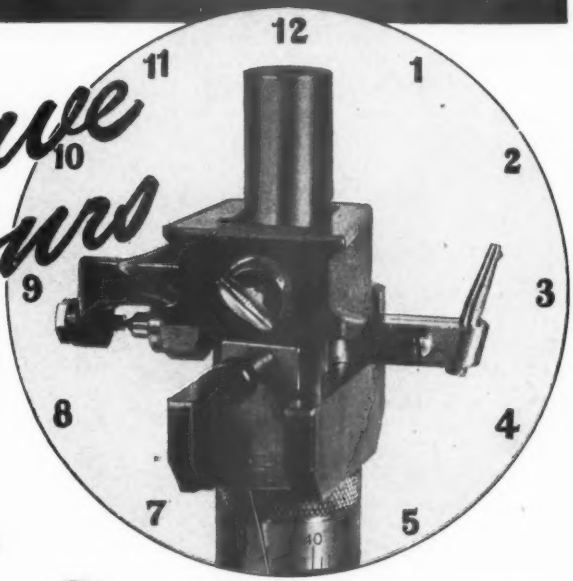

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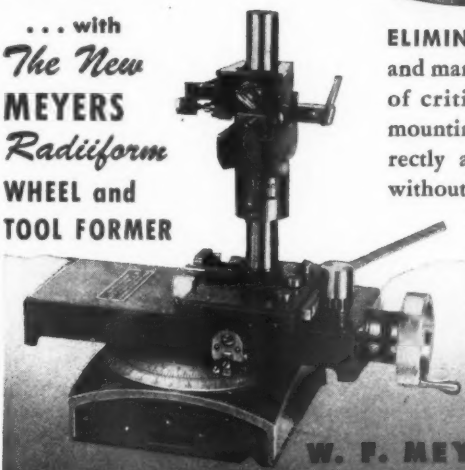

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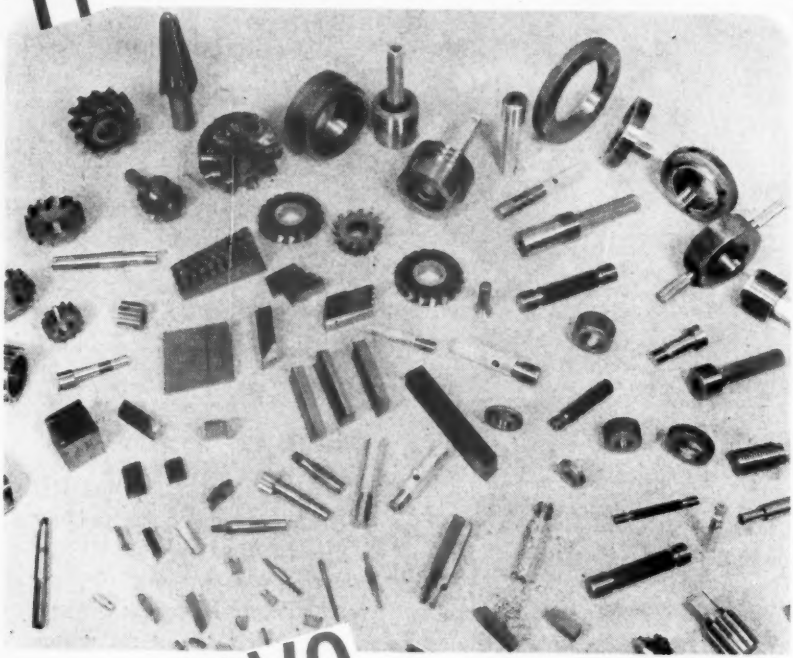

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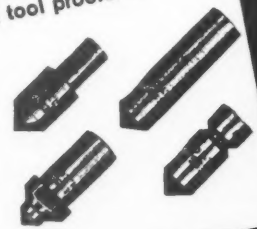

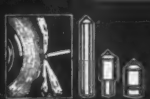

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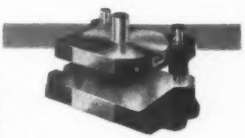

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A PLAN FOR ORDERLY DISPOSAL OF GOVERNMENT EQUIPMENT

ONE of the principal problems which arises continually to plague those who are doing some of the profound and decidedly necessary thinking about Industry's post-war responsibilities is that of providing employment for our boys when and as they return from the wars. Difficulties multiply when it is realized that we must maintain a high level of employment of those now at work. To believe that this can be done without interruption or dislocation is plainly wishful thinking.

Fortunately many men and women now in war plants and engaged principally in parts machining and assembling will return to civilian goods production, to the service occupations, to their own businesses, and women to their homes.

In most war plants, continuity of employment will be so closely tied in with reconversion that the first cannot be wholly successful until the problems of the latter have been successfully solved. In those industries, therefore, interruption would seem inevitable. On the other hand there are whole industries which can swing back into manufacture of their normal peacetime products with comparative ease. They will use their original machines and facilities, their problem being largely that of re-tooling.

There are other industrial groups whose uninterrupted operation is most vital, not alone because of the need for high-level employment, but because their products and services are fundamental to all manufacture. They are the *tooling industries*—machine tools; standard small tools and gages; and special expendable tools, dies, jigs, fixtures, gages, molds and machines.

In this discussion, we are concerned particularly with the machine tool industry and allied accessory manufacturers but in the same category are builders of other types of production equipment such as stamping presses, plastics molding and die casting machines.

The tremendous expansion of machine tool building facilities is well known. Walter W. Tangeman, former president of the National Machine Tool Builders Association, estimates that 1944 war production will require only about 25% of the industry's peak machine tool building capacity or approximately $325,000,000, and because of demands for particular types of armament, it is evident that that volume will not be uniformly distributed. Hence, one of our fundamental tooling industries must now, during war time, attempt to divert 75% of its specialized talents and facilities into other channels.

Even those circumstances shrink in importance when contrasted with after-war conditions when the market may be

flooded with Government-owned or controlled machines, most of which are current models. It is conceivable that the survival of the industry itself may be at stake. This situation existed after the first World War; it should not again.

The extent to which the machine tool has contributed to our nation's industrial pre-eminence is a matter of history. Without it mass production would not have been possible. If we are to retain our place in the forefront of the post-war world's industrial development we must re-dedicate ourselves to making more and better articles of manufacture available to more people by reducing costs through better manufacturing methods. Improved tooling and, particularly, ever more efficient machine tools are indispensable to this end.

It has been stated by authorities in the Machine Tool Industry that there are now under Government control a sufficient number of machines to satisfy Industry's normal needs for years to come. One estimate even makes it until 1955.

Regardless of how many surplus machine tools there actually are or will be, it is desirable that they be disposed of as early as possible, because it is essential to preserve the know-how, experience, personnel and facilities of the Machine Tool and other equipment building industries to the end that they may be able to continue their research, and develop and sell to American Industry the improved models which will enable it to maintain its industrial pre-eminence without interruption. Economic conditions also emphasize the vital necessity for early and orderly liquidation of such a large portion of Government inventory.

We, therefore, offer for consideration of Government and Industry executives the following plan for the orderly disposal of Government-controlled equipment which has, or will become unproductive because of the war's ending.

The Plan

At the earliest possible date the Committee for Surplus Machine Tool Disposal shall convene to establish valuation formulas. These formulas must be ready for use before any more equipment becomes idle.

The Committee shall consist of representatives of Government agencies and of the Machine Tool Industry.

The formulas shall be evolved as follows:

Each machine tool builder shall promptly submit to the Committee a "minimum productive expectancy" table for each of his types and models.

The Committee shall promptly approve or adjust them by comparison with generally accepted amortization tables.

The Committee shall have prepared a list of all Government financed machine tools.

Records of Defense Plant Corporation, War Production Board and other Government agencies should readily make available, dates of installation, beginning of operation, cessation of operation, and original installed cost.

One additional factor vital to equitable evaluation is *total*

hours of machine operation. The Committee shall require this promptly from each plant management.

From the figures thus reported, the Government disposal value of a given machine tool can be fairly and easily computed. Total hours of operation divided by hours of "minimum productive expectancy" result in percentage of use-depreciation. Applied to the installed cost, we have the dollar depreciation and subsequently the disposal value—the sale and exchange price.

The Plan continues: With the ending of the war, the Government shall freeze all machine tools in which it has an equity.

Disposal values having been established, the Government shall offer all machine tools to bona fide American tool and production plants: a, for exchange for machine tools built prior to January 1, 1926, and included in the buyer's plant inventory for the prior period of at least one year; b, for cash or on such credit terms as will enable manufacturers with depleted reserves to resume efficient plant operation and insure attainment of full employment quickly.

The requirements and procedure for equipment exchanges shall be developed by the Disposal Committee. Because the benefits can be manifold and far-reaching, requirements shall be easy of fulfillment and procedure simple.

To begin, it would be well to exchange like for like, a new lathe for an old one, grinder for grinder, miller for miller. In every instance, the old model shall be sold for scrap or for a nominal sum to a partially industrialized country like China or India, to stimulate simple forms of industrial production, thus raising their standard of living and increasing their purchase of American-produced goods.

The exchange values of old machine models shall be developed by the Disposal Committee from present War Production Board and OPA records. They should be sufficiently liberal to bring Government surplus machines into productive use. It may even be desirable to make exchange of old equipment mandatory.

It should be repeated for emphasis that the value of this plan can be greatly enhanced by *immediate* preparation. Equipment in Government plants already idle should be evaluated and made available on an exchange basis to plants which can make it productive. The newer models will step up war parts production at a time when we need it and the old models will help relieve the present severe shortage of scrap.

Editor

Accuracy and the Geometry of Precision

E. Willard Pennington
TECHNICAL EDITOR

IN the physical sense, or, still more definitely as pertaining to metal working techniques, that quality or characteristic known as accuracy must be defined and applied three ways.

This was established and masterfully presented thirty years ago by Frederick A. Halsey in his classic book: "Methods of Machine Shop Work." Writing in a style both pleasing and authentic by the very precision of its simplicity, the basic principles he derived and expressed are just as true and applicable today as when he first set them on paper.

The three kinds of accuracy are equally and mutually important, so the order in which they are mentioned is not to be construed as an intimation of relative importance of one over another.

First, there is accuracy of position or adjustment. By this we do not mean the attaining of accuracy of position by the manipulation of an adjusting screw, because that involves using a variable means to attain an accuracy of position or adjustment that did not previously exist. What is meant is the kind of accuracy that must be inherent in a machine tool; whereby, for instance, through the application of precision workmanship to lathe manufacture the final adjustments or positions are such that the head and tailstock spindles are in as nearly perfect alignment as possible, and the cross slide line of travel is truly at 90° to the center line of the spindles.

Second, and probably the most frequently considered definition or kind of accuracy, is that pertaining to size. Surely no one can gainsay that the development and perfection of the art of manufacturing to accurate size has contributed more than the fruits of any other field of endeavor to the material greatness of America. It is tolerance controlled accuracy of size that alone makes interchangeable manufacture possible and it is solely due to the tooling and production geniuses of this country that interchangeable manufacture and mass production have become synonymous. It is now their ceaseless and patriotic toil that is enabling our heroic fighting men and boys to "export" such an overwhelming preponderance of articles of manufacture—and suddden death—to our Axis enemies that they shall learn the hard way never again to trifle with the industrial and fighting might of this country.

For the third accuracy, that of form, there is, according to Halsey, no unit of measurement or standard specification for form as such; it being but a

function or result of the method of production.

From this it would seem that accuracy of form is an intangible, which it is in a sense, particularly as we approach that theoretical end limit in accuracy of form which must be purely a mathematical assumption or geometrical shape having no material substance.

However, the departure from accuracy of form can be most tangibly expressed in terms of the other two accuracies, i.e., position or adjustment (location) and size (lineal dimension . This Halsey indirectly points out when he says "If a planed surface is sufficiently accurate for the purpose, we call for planing; if scraping is needed we call for it, and if we want something better still, we call for lapping. In the same way turning, grinding or lapping is called for in connection with round work and in accordance with the degree of accuracy required. It does not follow that all planed, scraped, turned, ground or lapped work is of the same grade, but in the absence of any definite unit of accuracy of form, specifications of the method of production are the only recourse, the expectation being that the work will come up to the standard of the methods specified."

When a planed flat surface, for instance, is considered "sufficiently accurate" that means that we are satisfied with its degree of departure from the theoretical ideal in accuracy of form, which is a true geometric plane. We become so satisfied only when, and if, we can say that all significant points on the surface are located (accuracy of position) within a satisfactory *distance* (accuracy of size or dimension) of our true geometric plane. This necessitates that, for reference and/or measurement, we have available a flat surface of the closest possible approach to the theoretically ideal but intangible geometric plane.

We have such a surface in the familiar and so often abused scraped surface plate. It is a shop tool that is at one and the same time inexpensive and priceless. If we didn't have it (by virtue of not knowing how to make it) there could be no such thing as precision work, no interchangeable manufacture, no mass production and hence no industrial giant that we know as America.

Having defined accuracy and understanding how basically essential it is in every sense of the word, let us explore the idea of lack of accuracy in order to lay a foundation for the acceptance of the ultimate proof of accuracy.

Again, Halsey leads the way by explaining that "in all machine work there is an inherent tendency toward degradation of workmanship. The manufactured product is never as good as the gages to which it must conform and it is very seldom as good as the machine tools on which it is made. This tendency arises from several causes and is of such fundamental importance as to require the giving of concrete examples."

This he proceeds to do by assuming that the dividing head of a universal milling machine be set up for a gear cutting job. The principal parts of the dividing head that determine the accuracy of the gears to be cut are the spindle, the worm wheel, the worm and the index plate. At best, these parts will contain errors that can be measured, and as the gear blank is successively indexed from one tooth position to the next, the several dividing head parts assume relatively varying positions and the several errors, in various combinations, become the errors in the spacing of the gear teeth. Although the component errors are made up of both plus and minus values, there will be positions when the errors are simultaneously plus and at these points the errors in the new gears must exceed the individual errors of the dividing head parts.

Let us next consider these new gears used as the change gears in a lathe on which a screw is to be cut. The errors in the change gears and the inherent errors in the lathe lead screw will also combine and recombine in like fashion with an end result that the newly cut screw will be of an error greater than the individual errors of the lathe parts.

Remembering that the lathe change gears were cut on the initial dividing head, if the screw cutting job on the lathe was that of making a worm for another dividing head which in turn is to be used for cutting more lathe change gears, a vicious circle has been set up and for each time that we go through the cycle the product becomes successively worse! This illustrates and serves

as proof of the degradation of workmanship from geometrical causes.

Therefore, can it not be said that if, as more work is done quality diminishes, then, when less work is done, quality is enhanced? We think that Halsey's "degradation of workmanship" bears this out.

Next, dare we carry that reasoning to the opposite extreme and say that the ultimate in precision and/or accuracy can only be attained when it is in no way dependent upon any work previously done? The affirmative answer was in the invention of the original and only mathematically self-proving precision process, i.e., the method of creating or generating the mechanical or material equivalent of a true geometric plane.

The invention was made over 100 years ago by the eminent English engineer, Sir Joseph Whitworth.

Today there prevail more machine shop methods and machine design practices originated and successfully established by Whitworth than by any other pioneer manufacturing engineer. He built up a great manufacturing enterprise which still exists although it is now consolidated with the plant of Sir W. G. Armstrong.

According to Halsey "The leading characteristics of Whitworth's work were high-class workmanship, massive construction, hollow frame members, appropriate design, proper distribution of metal, smooth surfaces, rounded corners, straight lines or long sweeping curves and appropriate paint." Couldn't that description apply to the theory and practice evidenced by any modern American machine tool as well?

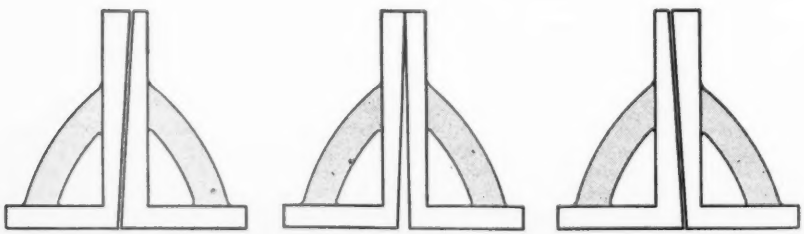
It was Whitworth who originated the English screw thread form that bears his name and who recognized that "the soul of manufacture is duplication." Although he did not invent them, it was Whitworth who first produced and duplicated plug and ring gages to a degree of accuracy entitled to the name of precision and who furthermore made them available to industry by first offering them for sale. From about 1850 to 1880 the Whitworth works were headquarters for such tools which during that time could be obtained nowhere else.

The invention of the method of creating or generating truly flat surface plates was first announced by Whitworth in 1840. It was, and still is, the only process by which flat surfaces can be produced without reference to previously made plates, and without being dependent upon any work previously done. It also is the only process which in itself supplies the proof of the accuracy of the result.

Although we may treat it as a commonplace thing today, it was, when announced by Whitworth, received and published by one of the world's foremost scientific societies, The British Association for the Advancement of Science.

As Halsey reports "The publication of this paper took place in 1840 and it marks an epoch in the history of the machine shop, as it marks the birth of the attainment of precision. Prior to that date there was no known means of making truly flat surfaces, which is equivalent to saying no known means of doing precision work of any kind."

Editor's Note: The next article of this series will detail the methods of generating or originating and proving the "truth" of flat surfaces, straight edges, right angles on squares, and 30°, 45° and 60° angles.



APPOINTED T & D TECHNICAL EDITOR

E. Willard Pennington, recently appointed technical editor of the Tool & Die Journal, brings to the editorial staff an abundance of practical tooling and production experience. This began in the years when radio was just plain "wireless" and the development and manufacture of equipment for it was truly pioneering.

Later, and for some years, Willard Pennington conducted his own business as a sales engineer, representing leading American manufacturers of cutting tools, precision instruments and gages. Thus he benefited regularly by the analysis of tooling requirements and the development of gaging programs.

Becoming more and more interested in optical measurement and inspection and still wider applications of optics to production operations, it was natural that "Bill" Pennington should have welcomed the opportunity to become a project engineer with the Weldon Tool Company of Cleveland, Ohio.

There he initiated, developed and carried to successful completion the application of optical control to machining processes. This involved also patent development work and accompanying all-around experience in the production and use of standard and special cutting tools.

Readers of the Tool & Die Journal may look forward to a high standard of genuinely interesting and useful technical articles and descriptive material on tooling and production.

G. J. H.

ELECTED HONORARY LIFE MEMBER

Members of the newly organized National Tool and Die Manufacturers Association have elected Tool & Die Journal Editor George Huebner to honorary life membership. In making the presentation General Manager M. W. Rowell recalled Editor Huebner's interesting association with the Tool and Die Industry.

This association began in 1933 with the Automotive Tool & Die Manufacturers Association of Detroit, of which he became secretary. During this period Detroit Tool & Die Shops developed the skilled workers' registration plan which, during the severe unemployment conditions prevailing during 1934 and 1935, became a stabilizing factor by making job opportunities more readily available to experienced tool, die and gage makers. Automobile and parts manufacturers operating their own tool rooms cooperated in the registration plan and it received the commendation of the local Labor Committee of NRA. It was later adopted by other local divisions of the Industry.

Effective January 1, 1935, George Huebner was appointed National Code Authority for the Tool, Die and Machine Shop Industry, with 3,500 plants assigned to his jurisdiction. He was elected also Secretary and Treasurer of the Tool, Die and Machine Shop Institute.

In 1936 he began the development of the Tool & Die Journal. Originally published as the Industry's organ, Progress, the name was augmented by including in it the Industry's products, making it Tool-Die-Machine Progress. Always Tool and Die Shop interests were brought to the fore, the essential nature of special tooling emphasized and its vital contribution to mass production publicized.

In September of 1941, George Huebner's knowledge of and experience with the tooling sources of our country were recognized by appointment to the staff of the Office of Production Management, predecessor of the War Production Board.

Don E. Root.

ANGULAR-STAND JIGS

C. W. Hinman
Designing Engineer

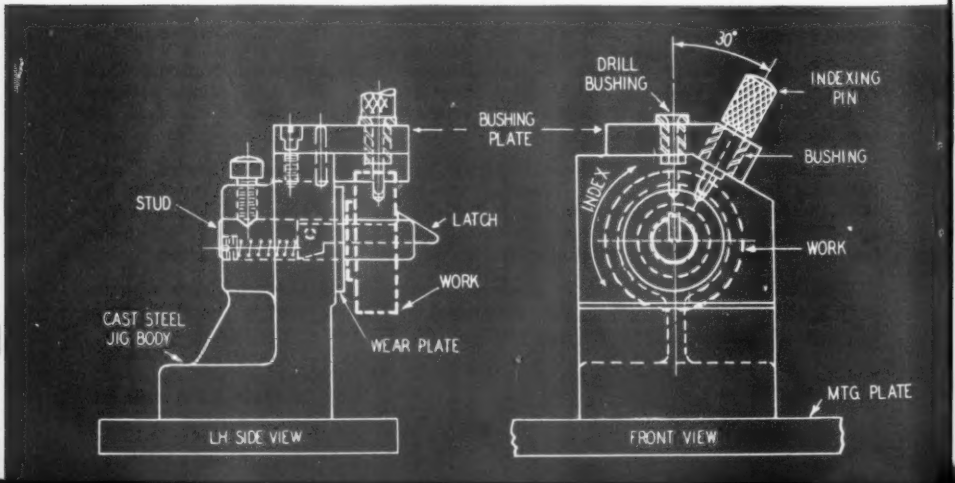
MANY types of work-pieces have shapes which are drilled to best advantage in angular-stand jigs. Angular-stand jigs are usually employed for drilling holes in edges of pieces. The pieces have been previously prepared by milling and/or by finishing in a hand-screw machine or automatic forming lathe. In the latter cases a drilled and reamed hole may be specified and is thus available for registering the work over a stud in the jig. The outstanding advantages of these jigs are their simplicity, economy of construction and the speed of loading and unloading.

A Simple Angular-Stand Jig

An angular-stand jig of simple construction is seen in Fig. 122. Several drilling operations can be performed simultaneously by securing two or more of these jigs in line on a long mounting plate and then clamping the plate down on the drilling machine table with one jig positioned under each spindle. After drilling, each piece is removed and placed in the next jig ahead and a new piece of work is placed in the first jig. Therefore, if we have a set of two or more jigs mounted in line on the same machine, one piece of work will be finished at each "strike" of the drills once the first work-piece has gone through all the successive stations.

The work shown in the sketch is a round steel blank as made in an automatic turret lathe and has a center hole

Fig. 122 — Angular-stand jig for drilling 12 equally spaced holes around the edge of circular work.



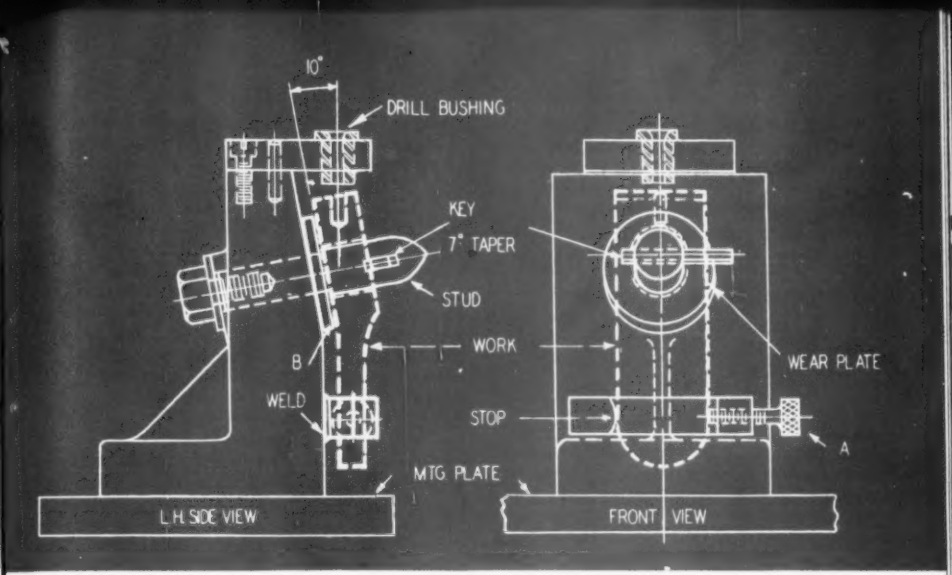


Fig. 123—Angular-stand jig that positions and clamps the work for drilling one hole at an angle.

which is drilled and reamed while the forming is being done. To load the jig, the work is placed on a stud which is fastened to the jig. The stud is provided with a latch-hook that lies in a horizontal position. The work depresses the latch while the piece is being pushed back against the wear-plate. Then a spring forces the latch-jaw to rise in front of the work to hold it on the stud in its proper position under the drill bushing. The face of the latch-jaw is rounded smoothly so that the work can be revolved on the stud.

After drilling the first hole, which can be at any position in the circle, the work is revolved in the direction of the arrow and the indexing pin is inserted in the drilled hole. This operation is repeated until the 12 holes have been drilled. To substitute an automatic stop in the drilled hole in place of the indexing pin is not practical because of drill burr interferences. Several advantages are available in this setup. For example:

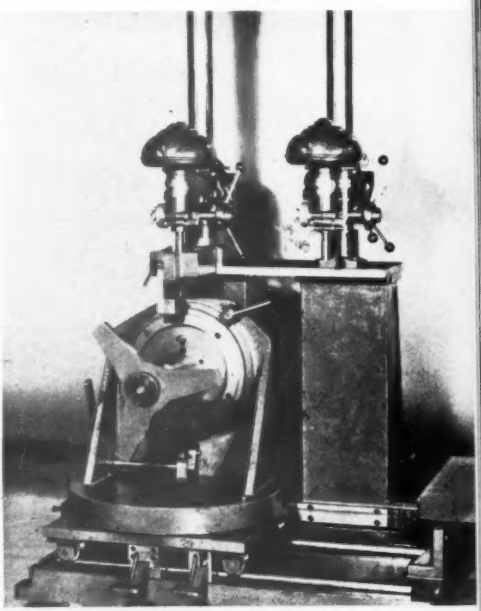


Fig. 124—In this set-up major attention was given to the jig so that the piece could be accurately indexed both vertically and horizontally. When this was accomplished, the drill press heads were added. This is a perfect example of building the machine for the job, and not adapting the job to the machine.

Photo courtesy: Delta Mfg. Co.

The drilled holes could be reamed in a similar jig, they could be countersunk and tapped, or counterbored if necessary. The entire circle of holes can be located differently by simply changing the projection of the stud and making another wear-plate of a suitable thickness.

Machine Designed To Suit An Angular-Stand Jig

Although this sounds like putting the cart before the horse it is nevertheless a sound proposal. It is sometimes expedient to arrange the required number of drilling heads into a specially built-up drilling machine, Fig. 124, to accommodate the drilling operations after the jig has been designed and built.

The spindle at the left is for drilling and the right-hand spindle can be used for either drilling, burring or tapping. In this novel setup attention was first given to the jig construction so that the circular piece of work could be accurately indexed angularly about a hole through its hub for vertical drilling and then moved horizontally to the second spindle for further operations.

This is a perfect example of the extent to which a self-contained unit can be designed and brought to lick a tough job. The work is clamped on a stud by the *C* washer in front of the three-armed clamp and the same clamp functions when the work is reversed and put on the stud "hub first." The jig can be indexed around for drilling the radial holes. The track which guides the jig wheels may be extended still further to the right thus permitting the work to be passed under as many additional spindles as the operations require. The latches shown in front of the jig base are used to lock its position at each of the two stations.

Drilling Holes At An Angle

Holes are quickly drilled in angular directions by positioning the work as

Fig. 125—Drilling angular oil distributing holes in crankshaft.
Photo Courtesy: Caterpillar Tractor Co.

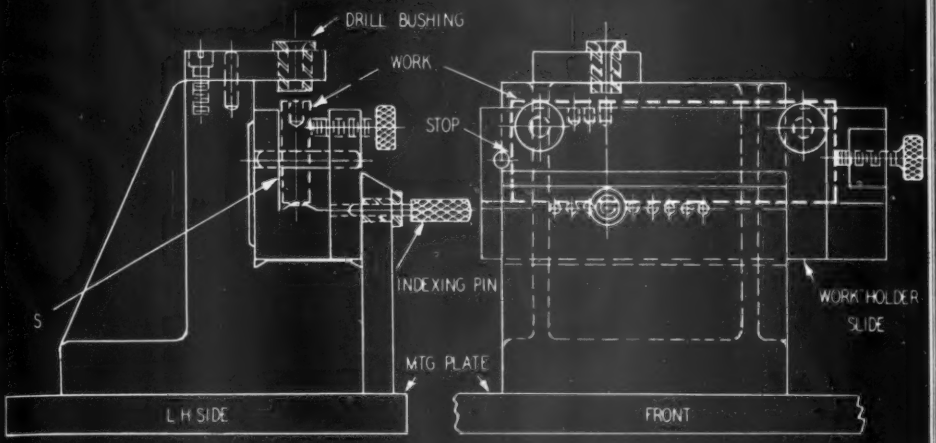


Fig. 126 — Angular-stand jig with an adjustable slide that holds and positions the work for drilling a row of holes close together.

seen in the jig of Fig. 123. The piece, having a drilled and reamed hole, is slipped over the jig stud. It is registered against the hardened wear-plate *B* by means of a tapered key through the stud and also against a positive side stop by the knurled-headed clamping screw *A*.

Drilling Deep Angular Holes

Although not an angular-stand jig as described above, Fig. 125 shows a comparatively large drilling machine in which motor-driven spindle heads can be adjusted individually and then locked in position for drilling two angularly related holes simultaneously. The work is clamped with cams and locked by the hand screw and pin shown at the right. The work-piece is a small forged steel double-throw crankshaft. This operation drills oil holes for the main bearings of the crankshaft. A constant flow of lubricating coolant is delivered by a pipe to each of the drills.

Drilling Holes Close Together

Fig. 126 shows a method for drilling holes very close together. The work is clamped to a horizontal adjustable slide by three knurled-headed thumb screws. The slide and work can be "stepped along" for drilling a series of holes by removing and inserting the indexing pin. If the index hole spacing is less than the diameter of the holes to be drilled in the work, the drilled holes will break through into one another. This, therefore, is an easy way to drill a "nest" of holes preparatory to milling elongated slots. In performing such an operation the precaution should be taken to at first drill only every other hole so that when the "break through" holes are drilled they will each "break through" into a symmetrical pattern of two previously drilled holes, thus lessening the danger of drill breakage. This piece of work can also be turned over and drilled in its opposite edge. By attaching a suitable plate or registering pins at surface *S*, the position of the row of drilled holes can be altered.

Jig Having Many Adjustments

To design a practical jig for drilling a number of straight holes in a piece of

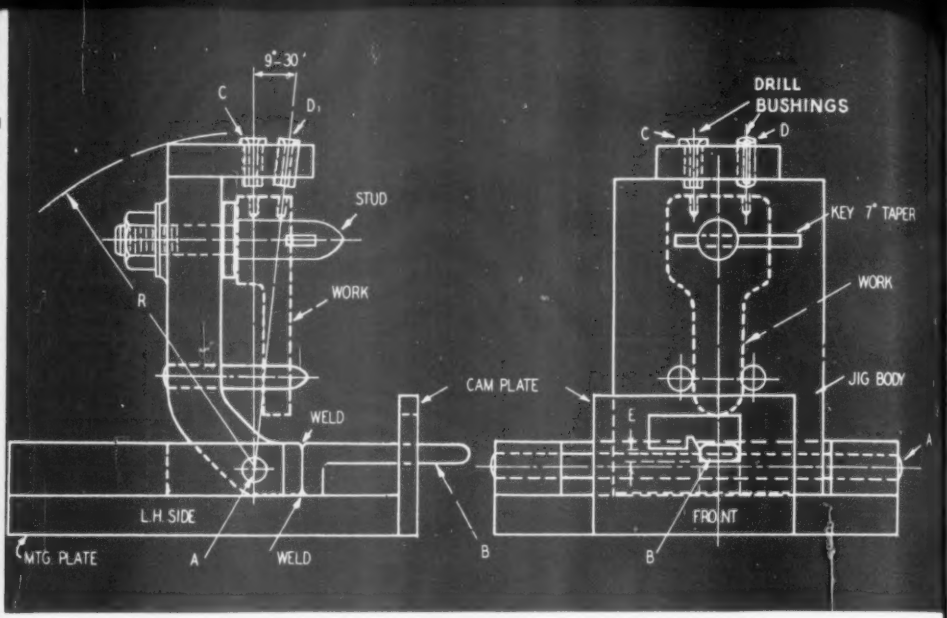


Fig. 127 — Hinged angular-stand jig that will drill either straight holes or holes at angles and at different locations in the same piece of work.

work, and other holes at various angles, of different diameters and in several positions, without removing the piece from the jig may be quite a troublesome order unless we understand the method shown in Fig. 127. The drilling positions of this jig can be changed instantly for drilling straight or angular holes.

As seen in the sketch, the jig body swings on hinge pin *A;* it can also be traversed from right to left on pin *A;* and both drill bushings *C* and *D* are radial to *A*, as indicated by *R*. Handle *B* is positively attached to the jig body and its lateral movement combined with its position in one or the other of two notches in the cam-plate control the registering of the drill bushings.

In the position of the jig body shown in the sketch, a drill can be entered in bushing *C* and a vertical hole drilled in the work, and when handle *B* is lifted from its notch and shifted into the other notch at the left, a drill can then be entered vertically in the (previously) angularly positioned bushing *D*. Height *E*, between the two notches in the cam-plate, is made to suit the angle of 9°-30' for drilling hole *D*. When several notches are necessary for drilling at various angles, the angles may be stamped under the respective notches or the notches may be numbered consecutively for the guidance of the operator.

By varying the quantity and heights of the cam-plate notches, and by supporting the jig mounting plate on four wheels that travel on rails, different sizes of holes can be drilled by other spindle heads and a multiplicity of angular holes drilled when required. As many as 20 drilling spindles have been set in line for doing work similar to that just described.

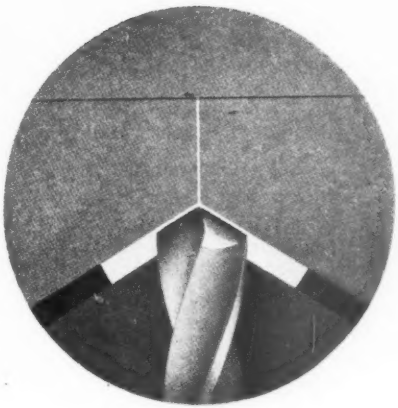
Here we have presented only a few of an endless variety of applications which can be successfully made of angular-stand jigs. Holes can be drilled in edges of triangular shapes, in edges of squares and rectangles, edges of circular work, hexagonal and octagonal pieces, or in sections of regular and irregular polygons and the drilling can be parallel with the flat sides of the pieces or at an angle.

TRAINING for VICTORY

EDITORS: DON E. ROOT CHARLES H. HAYNES

There is nothing more essential to the success of drilling operations than correctly ground drills.

The design and cutting action of a drill are such that for any given hole diameter and material the so-called correct drilling speed and feed are optimum or compromise values.

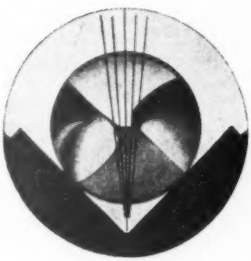


This prescribes proper drill grinding equipment because no "free-hand" grinding of drill points can insure the all-important symmetry of relief, included angle and center location.

These illustrations are of symmetrically ground drill points as viewed for inspection with optical drill point gages.

At the drill center the cutting action is zero, increasing to maximum effectiveness at the periphery of the cutting lips.

This variable being a necessary evil, every precaution must be taken that the shape of the drill point will be as nearly perfect as possible.



Industry's continuing demand for reprints of DRILLING TECHNIQUE has influenced us to add valuable material and herein reprint this most popular chapter of our Training for Victory series. Paper restrictions require that we release it in two parts and the second will appear next month.—Editor

A DRILL is a tool generally formed by milling, or forging followed by milling, in a cylindrical piece of steel, two equal and diametrically opposite spiral grooves. The spiral grooves or flutes, as they are called, have the correct shape to form suitable cutting edges on the cone-shaped end, to provide channels for the free egress of chips and to permit the lubricant to get down to the cutting edges when the drill is working in a hole.

It is, all things considered, the most efficient tool used by mechanics, for in no other tool is the cutting surface so large in proportion to the cross sectional area of the body or part that is its real support.

Parts of a Drill

A drill may be divided into three principal parts—the *point*, the *body* and the *shank*. The cone-shaped surface at one end is called the *point*. The two spiral grooves running along opposite sides of the drill are known as *flutes*. They are shaped to do four things:

(1) They help form the proper cutting edges on the point.

(2) At their junction with the cutting edges they are so shaped as to curl the chip tightly within itself—so that it occupies minimum space.

(3) The flutes also form channels through which the chips escape.

(4) They also allow the lubricant to get down to the cutting edges.

The *dead center* is the sharp edge at the extreme tip end of the drill. It is formed by the intersection of the cone-shaped surfaces of the point. It should always be in the exact center of the axis of the drill.

The *lips* (sometimes called cutting lips) are the cutting edges of the drill. They are formed by the intersection of the flutes and the point. The *heel* is the portion of the point back of the lips.

A real cutting edge would not be formed if the surface of the point were a 90° angle to the plane of rotation. Rather the edge would be a square corner too blunt to penetrate. To give a real cutting edge to the lips, the surface of the point is ground away or "relieved" just back of the lips. This relief is called *lip clearance*.

The narrow strip between the flutes (Fig. 1) is called the *margin*. It is the full diameter of the drill and extends the entire length of the flute. Its surface is part of a cylinder which is interrupted by the flutes and by what is known as *body clearance*. The body clearance is of less diameter than the margin, reducing friction between the drill and the walls of the hole. This clearance is necessary not only to reduce power but also because the friction might draw the temper of the drill or cause it to bind in the hole. The margin, however, insures the hole being of accurate size.

The *web* is the column which separates the flutes. It is the "back bone" of the drill. It gradually increases in thickness toward the shank to give rigidity to the drill.

Drills are not of the same diameter from end to end, but decrease in diameter from the point towards the shank by an amount varying from .0005 to .00075 inches per inch of length. The purpose of this *back taper* or longitudinal clearance is to prevent the drill from binding.

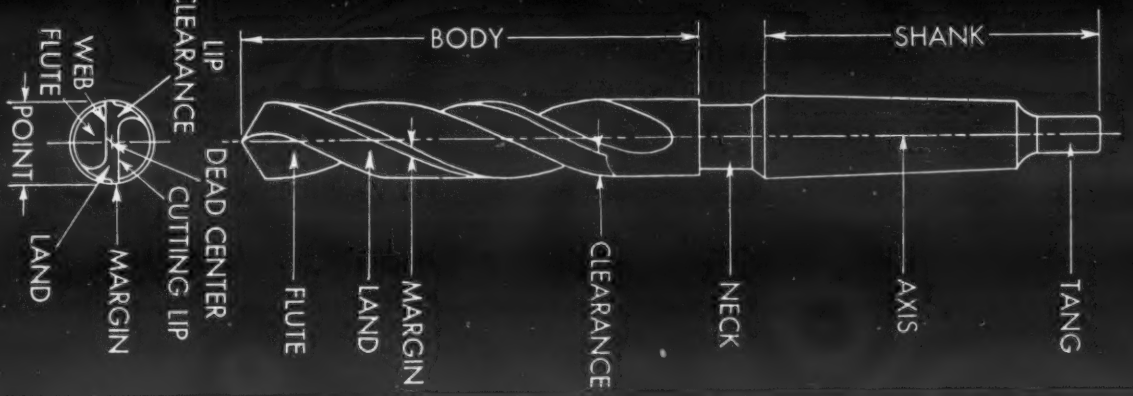
The *shank* of a drill is the end which fits into the socket or spindle or chuck of the drilling machine. There are a number of different types, the most common of which are illustrated in Fig. 3.

Points on Drill Grinding

The majority of the difficulties encountered in drilling arise from faulty grinding either of the point or the lip clearance. When grinding a drill, three things must be considered:

(a) Lip clearance.
(b) The length and angle of the lips.
(c) The location of the point and dead center in relation to the axis or center of the drill.

Lip clearance is the "relief" which is given the cutting edges in order to allow them to enter the metal without interference. Without this clearance it would

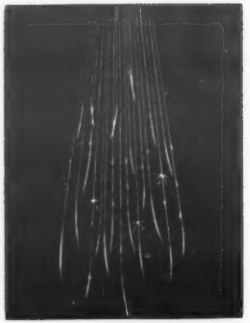


DRILL NOMENCLATURE

Shank Steel

Carbon Tool Steel

Tungsten High Speed Steel



Molybdenum High Speed Steel

CHARACTERISTICS OF SPARKS GENERATED BY THE GRINDING OF STEELS

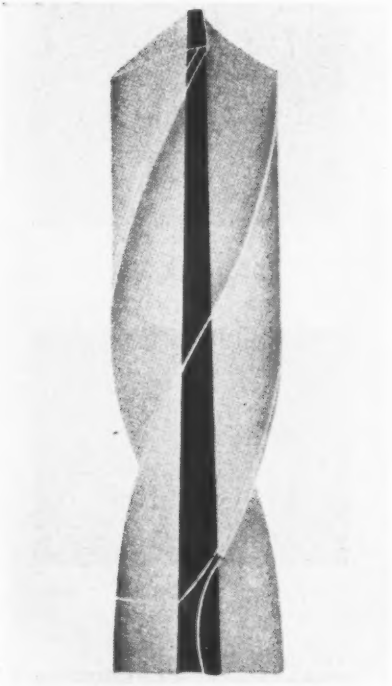


Fig. 2 — Diagrammatic illustration of a drill web. It is the metal column which separates the flutes.

be impossible for the drill to cut into a piece of steel. Fig. 4 illustrates a drill without clearance. Surface "S" of this drill would always be in contact with the metal and would effectively prevent the cutting edge from biting further into the metal. Such a drill would merely rub without penetrating. Therefore, the surface "S" back of the lips must be ground. The effectiveness and life of a drill depend to a large degree on the correct forming of this clearance.

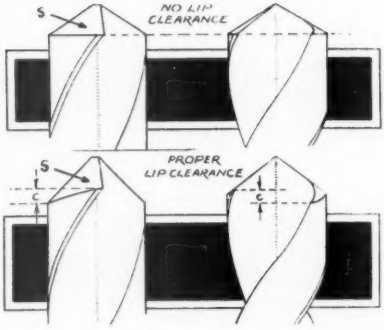


Fig. 4 (upper) — showing a drill point without any clearance. Note that both the cutting lip and the heel "S" are in the same plane. Lower — proper lip clearance. Note how much lower the heel line is than the cutting lip.

The *heel* (the surface of the point

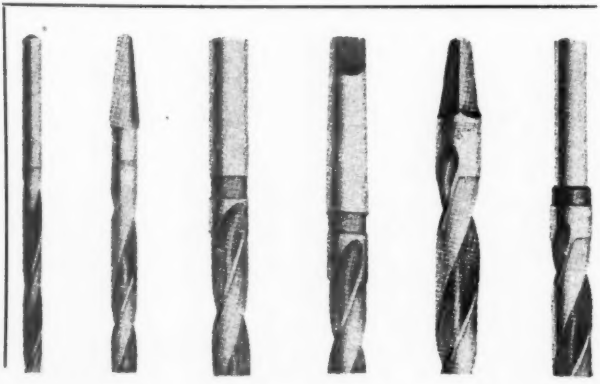


Fig. 3 — Six typical drill shanks.

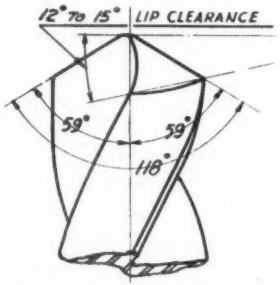


Fig. 5 — Showing the proper way to grind the surface back of the cutting lip. The angle indicated is the angle at the circumference of the drill. This angle should be increased as the center of the drill is approached.

back of the cutting lip) should be ground away from the cutting lip at an angle of about 12° at the circumference of the drill as shown in Fig. 5. This angle of lip clearance should be gradually increased as the center of the drill is approached until the line across the dead center of the drill stands at an angle with the cutting edge of not less than 120° or it may be as much as 135°. For heavy feeds in soft material, the lip clearance may sometimes be safely increased to 15°. Care should be taken,

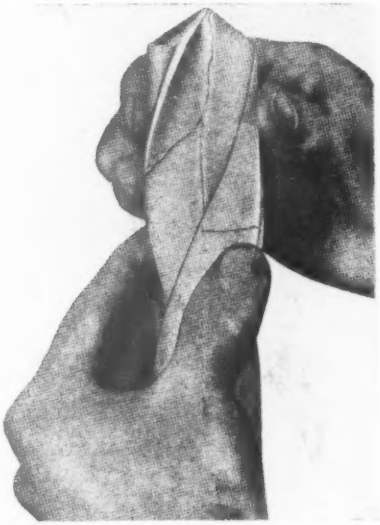


Fig. 7 — Here the drill was given insufficient lip clearance. As a result there ceased to be any cutting edges whatsoever and, as the feed pressure was applied, it split up the center.

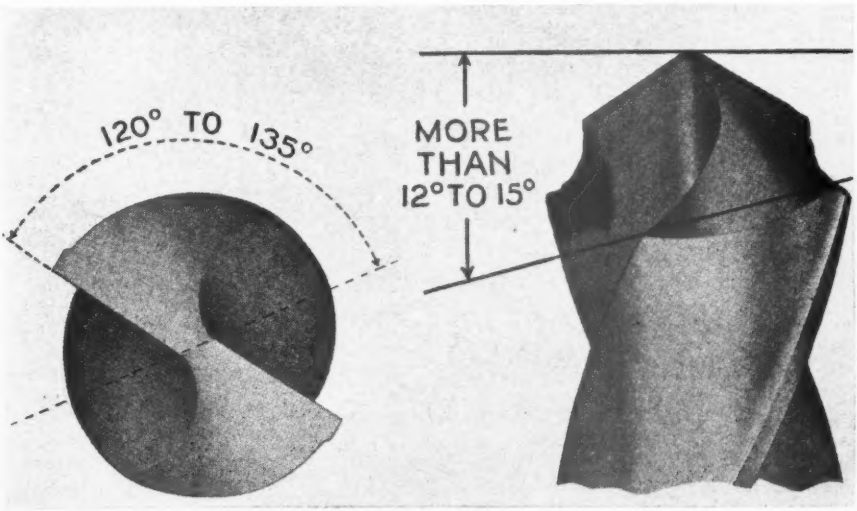


Fig. 6 (Left) — illustrates how to gauge lip clearance angle. Right — results of giving a drill too great lip clearance. The edges of the cutting lips have broken down because of insufficient support.

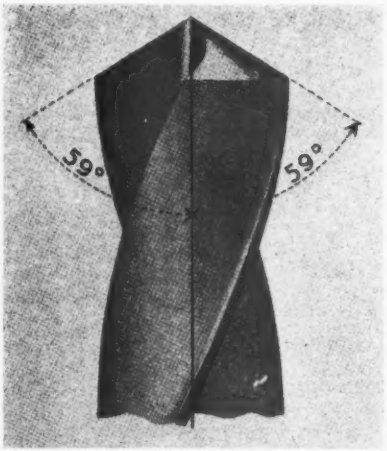
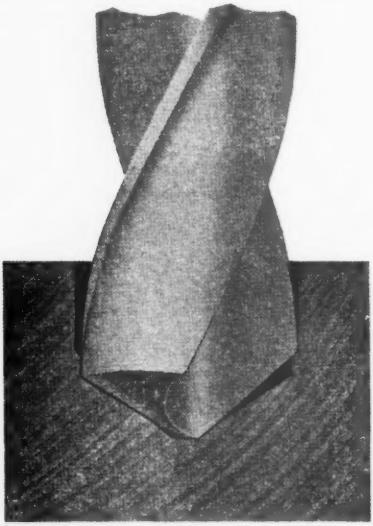


Fig. 8 — Correctly ground lips.

however, to see that the angle at the center of the drill is increased proportionately.

Fig. 9. — An example of a drill where the angles of the two lips vary. The cutting edge on the left is doing most of the work.



If the angle of lip clearance is too great, the edges of the cutting lip will break down (as in Fig. 6), because they will not have sufficient backing to support them—just as a razor edge breaks down if used for cutting tin, because it is too thin and lacks sufficient support to withstand the strain.

If insufficient clearance, the drill refuses to penetrate and may result in splitting the drill up the center (Fig. 7).

After grinding the proper lip clearance it is necessary to check that:

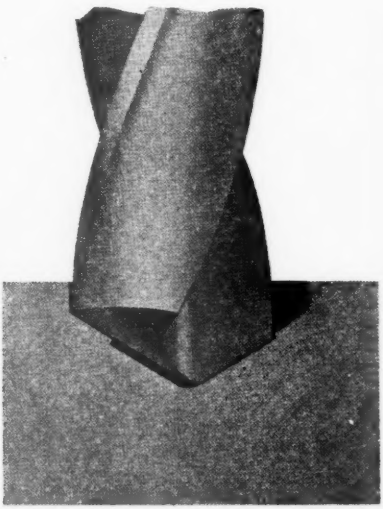
(a) The two lips are the same length.

(b) The angles of both lips (in relation to the axis of the drill) are equal and correct—59° is recommended for ordinary purposes (Fig. 8).

(c) If (a) and (b) are correct the third requirement, central location of the point, is also correct.

If the point is in the center but there are different angles on the cutting edges (Fig. 9), the drill will bind on one side.

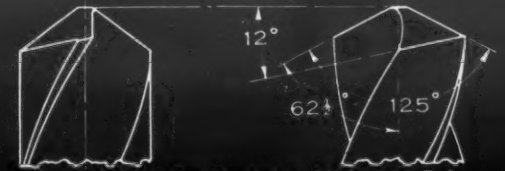
Fig. 10 — An example where the length of the lips are different. Note how large the hole is. This will cause considerable drill and spindle wear.



Crankshaft and Deep Hole Drilling

Steel Rails (7% to 13% Manganese) and Hard Materials

Wood, Hard Rubber, Fiber and Aluminum

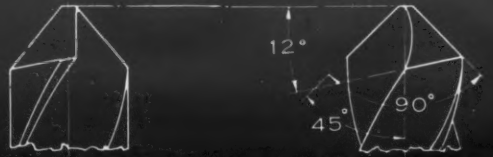


Heat Treated Steels, Drop Forgings and Connecting Rods

Copper and Some Copper Alloys

Bakelite, Plastic and Moulded Materials

Brass and Soft Bronze



Cast Iron, Hard Rubber, Fiber, Aluminum Alloys and Die-Castings

Drill Points Recommended for Various Materials

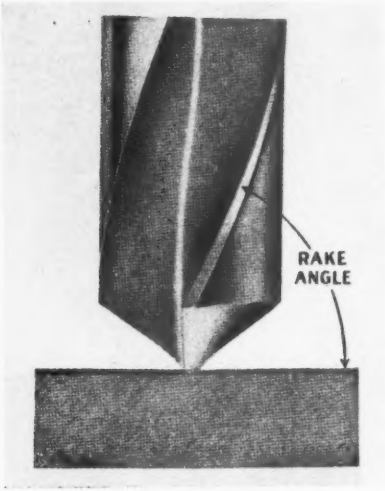


Fig. 12 — The rake angle is the angle of the flute in relation to the work.

Only one lip or cutting edge will do the work with resultant wear on this cutting edge, and the hole will be larger than the drill. Or if there are equal angles on the cutting edges but the lips are of different lengths, the point and lip will be off center. The effect of this condition is the same as though you put the axle of a wheel any place but in the exact center of the wheel (Fig. 10). The resultant strain on the press is tremendous and causes weaving or wobbling of the spindle and rapid wear on the drill.

Another part of the drill which performs an important function is the *rake angle.* This angle is the angle of the flute in relation to the work—shown in Fig. 12. If the rake angle were 90° or more it would not make a good cutting edge. If it is ground with too small an angle it makes the cutting edge so thin it breaks. The rake angle also partially governs the tightness with which the chips curl and therefore the amount of space which the chips occupy. In standard drilling practice the rake angle established by the manufacturer is correct and should not be altered.

When grinding a drill, never plunge it in cold water. Nothing will *"check"* (fill full of small cracks) a drill quicker than to put it in cold water after it has become heated while working or in grinding.

Drill Speeds and Feeds

When we refer to the *speed* of a drill, we mean the speed at the circumference, called the *peripheral speed.* Speed refers to the distance the drill would travel if it were laid on its side and rolled. Thus a drill with a peripheral speed of 30 feet a minute would roll 30 feet a minute.

Except under certain rather rare conditions, a drill does not pull itself into the work like a corkscrew—it requires constant pressure or *feed* behind it to advance it. This advance (measured in fractions of an inch per revolution) is called *feed.* Feed *pressure* however is the pressure required to maintain the feed.

Opinions differ regarding the correct speed and feed. There are no hard and fast rules that can be given. The suggestions on the next page should be considered merely as guides. The correct speed and feed can be determined only by good sound judgment in each particular case.

In starting a drill, bring it down to the work by hand feed until it centers itself in the work. Then throw in your power feed. Composition and hardness of material, depth of hole, lubricant, type machine used, condition of machine, set-up, point-grinding, quality of holes desired and many other items influence speed and feed.

Starting feed is governed by size of drill and material. A good general rule is to use a feed of .001" to .002" per revolution for drills smaller than ⅛"; .002" to .004" for drills ⅛" to ¼"; .004" to .007" for drills ¼" to ½"; .007" to .015" for drills ½" to 1"; and .015" to .025" for drills larger than 1".

It is a good idea to start the drill with a moderate speed and feed, increasing either one or both after observing the condition of the drill.

EQUIVALENT DRILL SIZES

Fraction and No.	Decimal	Metric
	.0039	.10
	.0059	.15
	.0079	.20
	.0098	.25
	.0118	.30
80	.0135	
	.0138	.35
79	.0145	
1/64	.0156	
	.0157	.40
78	.0160	
	.0177	.45
77	.0180	
	.0197	.50
76	.0200	
75	.0210	
	.0217	.55
74	.0225	
	.0236	.60
73	.0240	
72	.0250	
	.0256	.65
71	.0260	
	.0276	.70
70	.0280	
69	.0292	
	.0295	.75
68	.0310	
1/32	.0312	
	.0315	.80
67	.0320	
66	.0330	
	.0335	.85
65	.0350	
	.0354	.9
64	.0360	
63	.0370	
	.0374	.95
62	.0380	
61	.0390	
	.0394	1.00
60	.0400	
59	.0410	
	.0413	1.05
58	.0420	
57	.0430	
	.0433	1.10
	.0453	1.15
56	.0465	
3/64	.0469	
	.0472	1.20
	.0492	1.25
	.0512	1.30
55	.0520	
	.0531	1.35
54	.0550	
	.0551	1.40
	.0571	1.45
	.0591	1.50

Fraction and No.	Decimal	Metric
53	.0595	
	.0610	1.55
1/16	.0625	
	.0630	1.60
52	.0635	
	.0650	1.65
	.0669	1.70
51	.0670	
	.0689	1.75
50	.0700	
	.0709	1.80
	.0728	1.85
49	.0730	
	.0748	1.90
48	.0760	
	.0768	1.95
5/64	.0781	
47	.0785	
	.0787	2.00
	.0807	2.05
46	.0810	
45	.0820	
	.0827	2.10
	.0846	2.15
44	.0860	
	.0866	2.20
	.0886	2.25
43	.0890	
	.0906	2.30
	.0925	2.35
42	.0935	
3/32	.0938	
	.0945	2.40
41	.0960	
	.0965	2.45
40	.0980	
	.0984	2.50
39	.0995	
38	.1015	
	.1024	2.60
37	.1040	
	.1063	2.70
36	.1065	
7/64	.1094	
35	.1100	
	.1102	2.80
34	.1110	
33	.1130	
	.1142	2.90
32	.1160	
	.1181	3.00
31	.1200	
	.1220	3.10
1/8	.1250	
	.1260	3.20
	.1280	3.25
30	.1285	
	.1299	3.30
	.1339	3.40

Fraction and No.	Decimal	Metric
29	.1360	
	.1378	3.50
28	.1405	
9/64	.1406	
	.1417	3.60
27	.1440	
	.1457	3.70
26	.1470	
	.1476	3.75
25	.1495	
	.1496	3.80
24	.1520	
	.1535	.390
23	.1540	
5/32	.1562	
22	.1570	
	.1575	4.00
21	.1590	
20	.1610	
	.1614	4.10
	.1654	4.20
19	.1660	
	.1673	4.25
	.1693	4.30
18	.1695	
11/64	.1719	
17	.1730	
	.1732	4.40
16	.1770	
	.1772	4.50
15	.1800	
	.1811	4.60
14	.1820	
13	.1850	4.70
	.1870	4.75
3/16	.1875	
12	.1890	4.80
11	.1910	
	.1929	4.90
10	.1935	
9	.1960	
	.1968	5.00
8	.1990	
	.2008	5.10
7	.2010	
13/64	.2031	
6	.2040	
	.2047	5.20
5	.2055	
	.2067	5.25
	.2087	5.30
4	.2090	
	.2126	5.40
3	.2130	
	.2165	5.50
7/32	.2187	

We are indebted to the Cleveland Twist Drill Co., Republic Steel Corp., Chicago-Latrobe Twist Drill Works, Whitman and Barnes Co., Sellers Co., Mead Specialties Co., Delta Mfg. Co., Acme Industrial Co., Bausch & Lomb Optical Co., and others who provided illustrations and textual data.

★

PULL TO DROP TAKE-OFF GEAR
THIS INTERLOCK MUST BE OPERATED BEFORE THE HEAD CAN BE STARTED FORWARD
HIGH VOLTAGE CONNECTION
3 2 1 0 1 2 3
LOCATION AND LENGTH OF WHEEL TRAVERSE
BRAKE
POSITION #1 – OFF
POSITION #2 – ON
PUMP SPEED 700 S.S.F.
GOVERNOR SET AT 70 S.S.F.
GOVERNOR SPEED WHEN TESTING SPEED LIMITING GOVERNOR, FUEL OIL VISCOSITY MUST NOT EXCEED 70 S.S.F.

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GORDON B. THAYER*
Technical Consultant

PRESENTING RECENT NEWS, VIEWS AND TRENDS

Plastics Press Extrusions

"RECENTLY we had occasion to do a little rechecking on what has been taking place in the phenolic plastics industry during the past many months. We found a great many points of interest. Selecting a few that are of general interest we have briefed them as follows:

"Military service conditions are demonstrating the stability and versatility of the phenolic group. There has been a pronounced trend toward the use of phenolics for vital functional parts.

"Advanced speeds in aircraft power dives have made the resistance to atmospheric changes and sudden temperature changes imperative. From sub-zero to desert heat in sixty seconds is really quite a rapid change, and materials have to be inherently stable to withstand it.

"Progress in standardization of types of phenolics has been very noticeable. Not only have the Navy specifications given it impetus but the Signal Corps and the ASTM have also been particularly active in setting up standards which certain types must meet. This is of utmost importance to the industry as it will have considerable bearing on post-war applications and greatly facilitate the specification of plastics by product engineers.

"The matter of misterming plastics 'substitutes' has very definitely been receiving a greater setback. The supply of phenolics has become as critical as that of other vital structural materials and the WPB has established that their use as replacement or so-called substitute material may only be allocated where the plastics do a better job than the material previously employed. Plastics are standing on their own feet.

"Naturally, expansion has taken place in the industry. However, a considerable portion of this expansion was already pre-war planned. Still, production is not actually

*Research Engineer, Dow Chemical Co.

adequate for the requirements.

"There have been two very interesting developments which have not yet received publicity, for the usual security reasons, that will certainly hold the spotlight in one of the coming months. One of these has to do with a very unusual application of a Durez casting resin in a brand new field. The other has to do with low pressure laminating of fabric impregnated with a Durez resin. We hope to be able to release these applications within the next sixty or ninety days."

Durez Plastics News, Vol. 8, No. 7

★ ★ ★

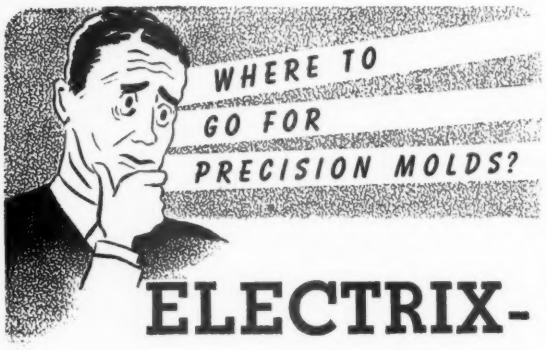
"The Fairchild AT-21 was designed primarily to train bomber crews to work as a team. Space and latest tactical equipment in the plane, one of the largest and fastest trainers yet to be built, are provided for pilot, co-pilot, navigator-radio man, machine gunner and camera man. Powered by two Ranger in-line air-cooled 12 cylinder engines, it is in the 200-mile-per-hour speed class. The only metal used in its construction is in the engine supports, instruments and certain other equipment supports. The balance of the plane is built of phenol resin-bonded plywood formed into rigid shapes and structures by the Duramold process. The entire exterior of the plane is finished in a rubbed aluminum paint with a Bakelite synthetic resin base, resulting in an outward appearance of a single piece of polished metal. The interior is finished with a clear varnish based on Bakelite resin. The plane's equipment includes a recent type bombsight in its plastic nose, and a machine gun in the power-driven plastic gun turret. A useful load of nearly two tons can be carried in the plywood fuselage. The main portion of this fuselage is of the monocoque construction, with all stresses being taken in the skin itself without the use of longerons or lateral stiffeners except surrounding the openings."

Bakelite Review, Vol. 15, No. 2.

★ ★

"An electric flare with a Bakelite polystyrene lens, carried as standard emergency equipment on U. S. Army trucks, is another timely example of how Bakelite plastics are used for extra dependability in Army gear. Manufactured by the K-D Lamp Company, the No. 605 electric flare is furnished to the U. S. Engineers for use in emergencies when an ordinary lamp with a glass lens would not come through without shattering. . . ."

Bakelite Review, Vol. 15, No. 3.



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PLASTICS READERS AND PLASTICS NOMOGRAMS

by Gifford M. Mast
Special Training Devices Section
THE JAM HANDY ORGANIZATION

THE Nomogram Reader is a special rule to simplify and speed calculation with Nomograms, or Alignment Charts, as they are frequently called.

Nomograms are calculating devices much used in engineering and mathematical work to solve particular equations easily and directly, and with a very limited number of operations. The two shown were designed for use in the complex calculations called for by a Navy project under way at Jam Handy.

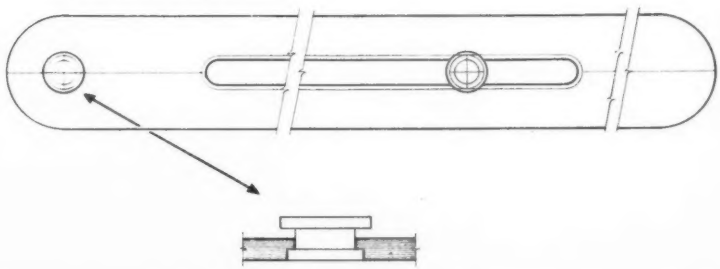
The Nomogram Reader, which may be produced inexpensively, is made from $\frac{1}{32}$" Plexiglas and in its simplest form has a single transparent pivot with cross hairs as shown in Fig. 3. It may also have a sliding pivot as does the Reader shown in Fig. 1 and Fig. 2.

The simplest and most common type of nomogram is a chart solving an equation in three variables, the values of any one of which may be read from it if the other two are known. It consists of three scales, each one bearing the desired range of values of the variable it represents.

The usual method of reading such a nomogram is to place a ruler on the known value of the first variable, swing it until it crosses the known value of the second variable, and read the desired answer where the ruler crosses the third scale. However, in lining up the ruler with the second scale setting, it generally becomes displaced from the first one so that several adjustments have to be made before an accurate reading can be taken.

For use with this type of Nomogram, the simple form of the Nomogram Reader having only one pivot is used. The cross hairs of the pivot are set on

Fig. 1—Enlarged view of nomogram reader in Fig. 2 through the pivot-cross section.



the known value of the first variable and a finger placed firmly on the pivot. The rule may then be rotated freely until its index line lies on the known value of the second variable without any chance of the rule becoming displaced from its first setting. The answer is then read where the index line crosses the third scale.

The transparent plastics pivot makes it possible to accurately locate the first setting and maintain it while establishing the second. The index line permits more accurate reading and interpolation than does a ruler, because there is no obstacle to vision. Parallax is eliminated by having the index line etched on the lower surface of the Plexiglas rule.

The use, in the Nomograms illustrated, of Plasticele instead of graph paper may be of interest to designers and users of Nomograms. The Plasticele is undistorted by humidity, withstands hard usage, and does not mark or soil easily. If soiled, it can be cleaned with a moist cloth. To prevent abrasion of the scales they are inked on the reverse side. To facilitate laying the scales out in pencil and inking them, sheets with one frosted side are used.

Equations with more than two known variables require for their solutions the use of "multiple" Nomograms, necessitating several settings of the rule, and often the marking of a point on a blank scale. Such a Nomogram is being used in Fig. 2. The old method of using such a Nomogram is to set the rule on the first two known values, make a mark on the center scale, and then swing the rule to align it with this mark and the third known value. The desired answer is then read where the rule crosses the fifth scale.

This Plastics Nomogram Reader with both fixed pivot and sliding pivot does away with most of the usual difficulties. The fixed pivot is used in the manner described before, but instead of marking the blank scale, the sliding pivot is placed on it and held there while the rule is rotated to the third known value. The desired answer may then be read where the index line crosses the scale of the unknown.

Photos courtesy: Jam Handy Organization

Fig. 2—Nomogram reader with box fixed and sliding pivot.

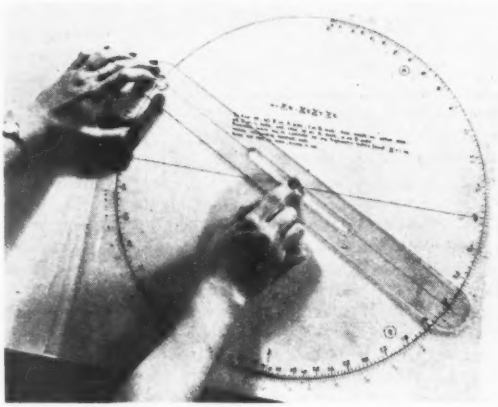
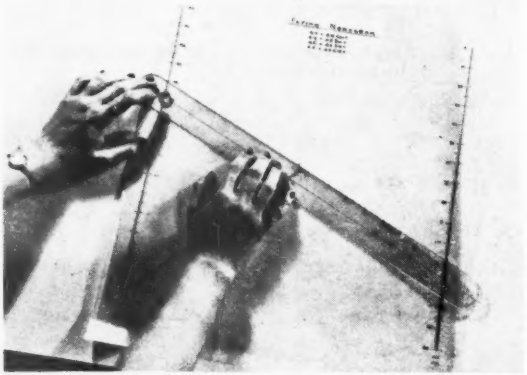


Fig. 3—Single pivot nomogram reader.



REMOVING MOLDING "FLASH" IN A FLASH

IN the production of plastic molded products the removal of "flash" often constitutes a time consuming and laborious hand operation. This prevails particularly where flash occurs in round sections, from so-called positive molds, such as instrument mounting holes.

This problem as it existed in the plant of the Weston Electrical Instrument Corporation was ingeniously solved by Walter V. Swartz of their Bakelite Molding Department. An initial award of a $50 war bond was made to Mr. Swartz and the idea was passed on to the War Production Drive Headquarters in Washington by the Suggestion Box Committee of Weston's Labor-Management Production Drive.

Because this style of molding is commonly used throughout industry and since this instrument mounting flange in particular is produced to a standard Army and Navy specification for use with many manufacturers' instruments, it is hoped that the device may prove of widespread help in the removal of excess material encountered in molding operations generally. It replaces a number of hand operations using three-cornered scrapers and files thus increasing the production of such items considerably.

Figure 1

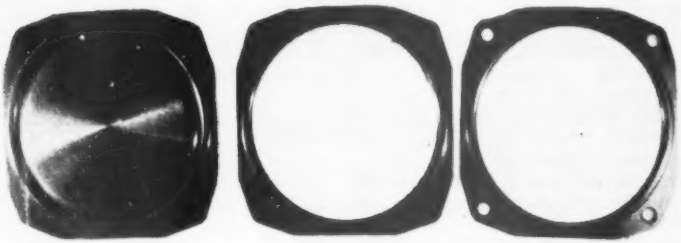
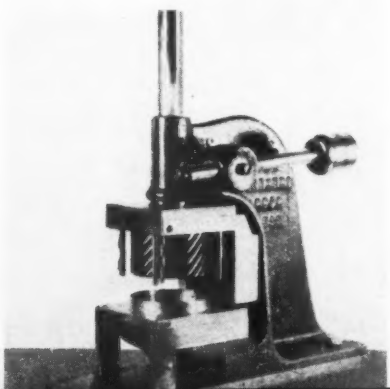


Figure 2



In the photograph, Fig. 1, are shown from left to right, first, a standard A-N instrument flange as it comes directly from the molding press; second, the same flange with its center over-flow pushed out by the old method but with flash still in the mounting holes; and third, a flange that has been processed

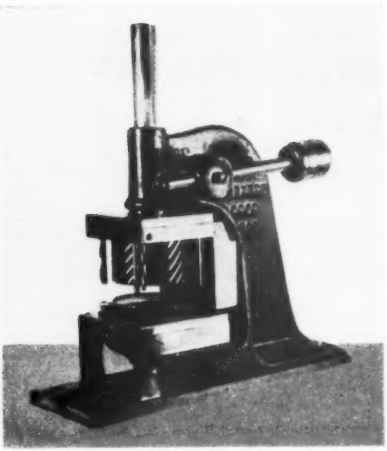


Figure 3

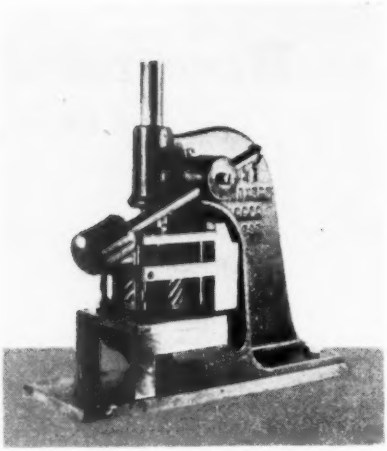


Figure 4

by the new flash removing tools and consequently requiring no hand operations whatever.

Fig. 2 shows the device which consists of a bench arbor press "tooled up" for flash removal.

Fig. 3 is a demonstration set-up with the flange in position. The flash in the large central orifice is removed by a spiral cutter much like a milling cutter in appearance and having a diameter equal to that of the finished opening in the flange. Four drills are located radially for the removal of flash from the flange mounting holes. Also evident are the knockout pins for clearing the work from the tools.

In Fig. 4 the tools have entered the work. The straight line motion of the press stroke, combined with the spiral flutes of the center cutter and corner hole drills, results in a shaving action which clears or shaves the openings of all flash. The knockout pins and the upper "floating" plate of the fixture to which they are attached rest upon the molded piece during the down stroke.

As the cutting tools are removed from the work by the up stroke of the press, as in Fig. 5, the knockout pins securely hold the work down until the tools are fully withdrawn from the flange as in Fig. 6.

Figure 5

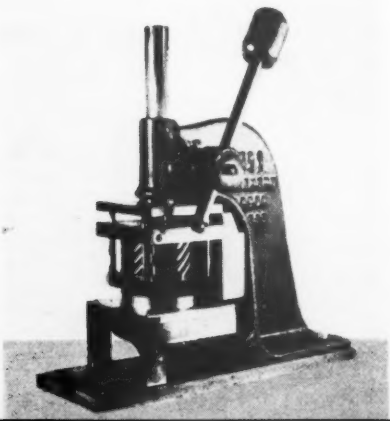
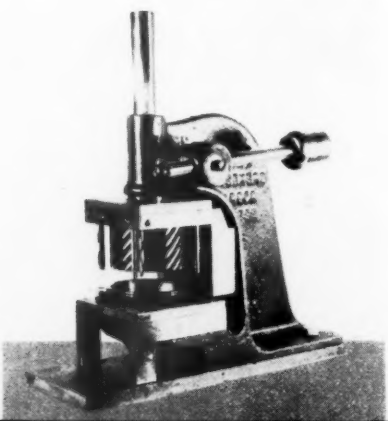
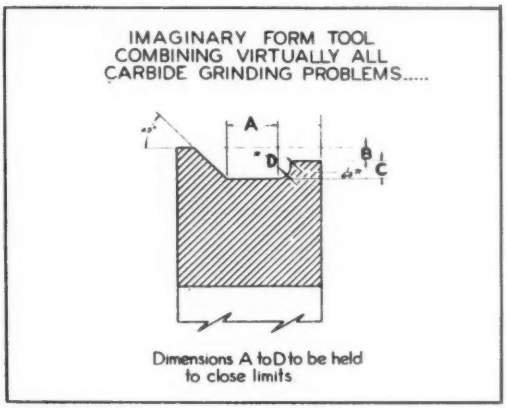


Figure 6



"SHORT ORDER" FORM TOOL GRINDING

THE great increase in war production utilization of cemented carbide cutting tools has occasioned a parallel increase in specialized training programs in the grinding of form tools made of these hard metals.



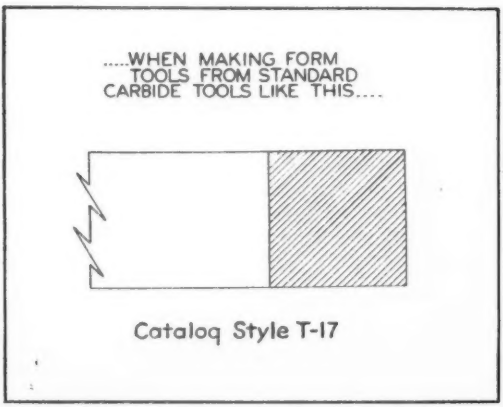
Stimulated by the necessity of practicing the utmost in cutting tool and manpower conservation many manufacturers today purchase the mass-produced, highly standardized carbide turning tools and grind these in their own tool rooms to the special forms required.

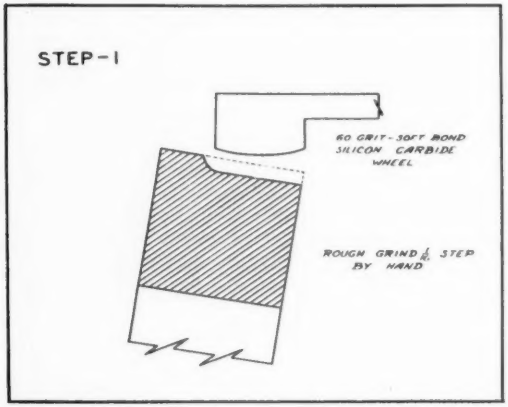
Because of the great range of sizes offered by standard tools the over-all dimensional requirements of many special form tools can be satisfied by simply choosing the appropriate stock item from a catalog of standard tools.

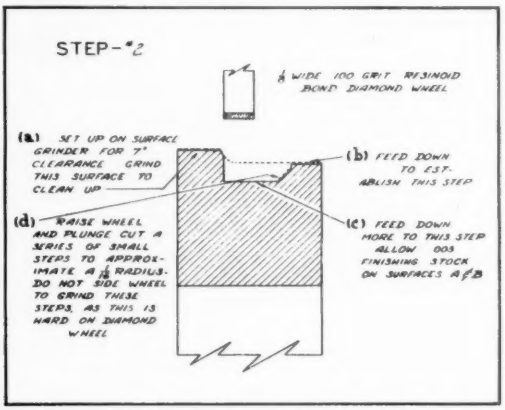
The grinding of special form tool profiles presents no great difficulty to the experienced operator, but the extreme hardness of carbide does necessitate a change in grinding technique from that employed in the grinding of form tools from high-speed steel.

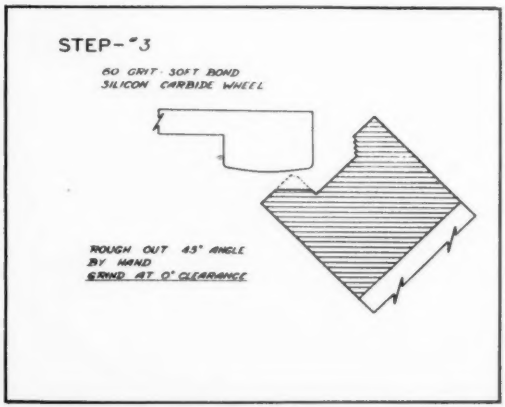
A better and more graphic understanding of the basic principles involved in actual grinding operations on carbide tools may be acquired by studying the accompanying sequence of functional diagrams which portray a specific training project in the curriculum of the school for carbide supervisors conducted in the plant of the Carboloy Co. of Detroit.

The first figure, having






STEP-"2
⅛ WIDE 100 GRIT RESINOID BOND DIAMOND WHEEL
(a) SET UP ON SURFACE GRINDER FOR 7° CLEARANCE. GRIND THIS SURFACE TO CLEAN UP
(b) FEED DOWN TO ESTABLISH THIS STEP
(c) FEED DOWN MORE TO THIS STEP ALLOW .005 FINISHING STOCK ON SURFACES A & B
(d) RAISE WHEEL AND PLUNGE CUT A SERIES OF SMALL STEPS TO APPROXIMATE A ⅛ RADIUS. DO NOT SIDE WHEEL TO GRIND THESE STEPS, AS THIS IS HARD ON DIAMOND WHEEL



the lettered dimensions, represents the profile of an imaginary form tool as assigned to the students for grinding. It will be apparent that its design has been evolved to incorporate specifications combining virtually all grinding problems encountered in the production of form tools and is not of any more complicated profile than is often encountered in actual practice.

The adjacent figure represents a T-17 type of standard carbide tool of such dimensions as will safely encompass the form tool profile.

The following nine "schematic" diagrams illustrate the order and manner in which the successive grinding operations are to be performed.

Step 1 shows the rough hand grinding as done with a 60 grit, soft bond, silicon carbide wheel to remove stock and partially establish dimension "B".

Step 2 is a surface grinder set-up using a 1/8" wide, 100 grit, resinoid bond, diamond wheel. The tool is set for the 7° front clearance angle; surface "a" is cleaned up and then, by feeding down, surface "b" is semi-finish ground to establish dimension "B". The next operation is to rough out the material in the center to approximate dimensions "A" and "C". The center portion is first hogged out, to allow .005" finishing stock on surfaces "a" and "b", and then additional material is removed by plunge grinding preparatory to finishing radius "D". In executing the plunge cuts, which are

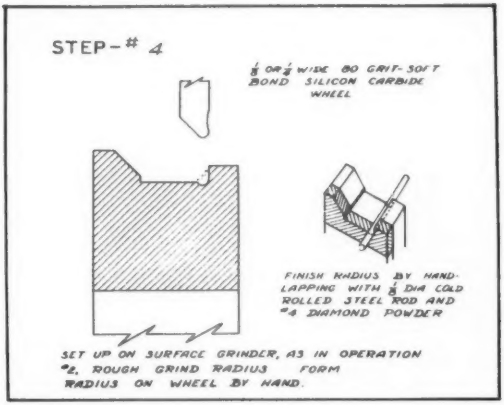
made up of a series of small steps to approximate a 1/16" radius, every precaution must be taken not to "side grind" these steps because that is a most severe abuse of the diamond wheel.

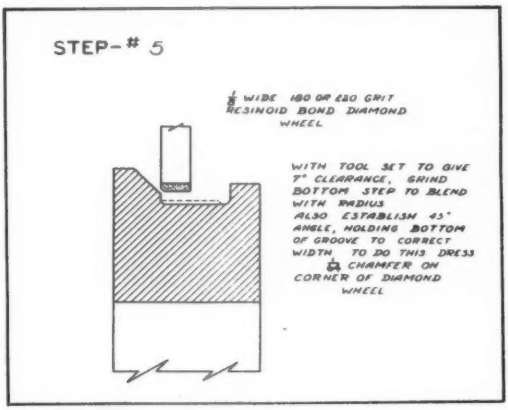
In Step 3 the 45° angle of the profile is roughed out. This is done by hand on a tool grinder with a 60 grit, soft bond, silicon carbide wheel and is ground at 0° clearance.

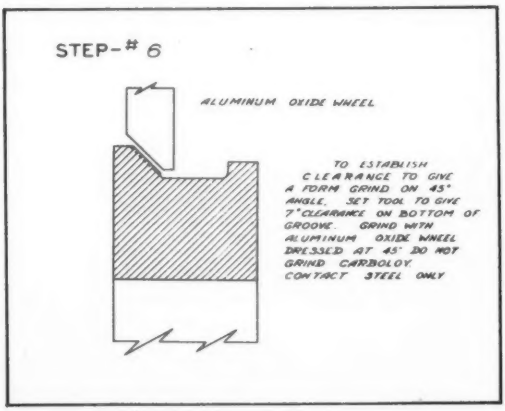
Step 4 shows the manner in which radius "D" should be semi-finished and finished. Note that this radius is completed before "C" is ground to full depth. The semi-finishing of radius "D" is a surface grinder operation employing a 1/8" or 1/4" wide, 80 grit, soft bond, silicon carbide wheel and the approximate radius is formed or "dressed" in the wheel by hand. The radius is finished as shown by hand lapping with a 1/8" diameter cold rolled steel lap charged with #4 diameter powder.

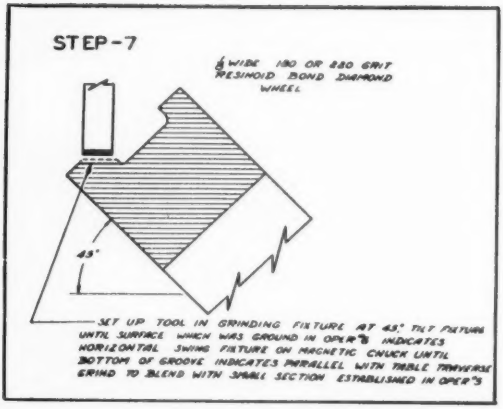
Step 5 is that of grinding "C" to full depth. Using a 1/8" wide, 180 or 220 grit, resinoid bond, diamond wheel, and with the tool set to give 7° clearance, grind this bottom step to blend with radius "D". Also establish the 45° angle taking care, at the same time, to hold bottom of groove to correct width. This is done by dressing a 45°, 1/64" chamfer on the corner of the diamond wheel.

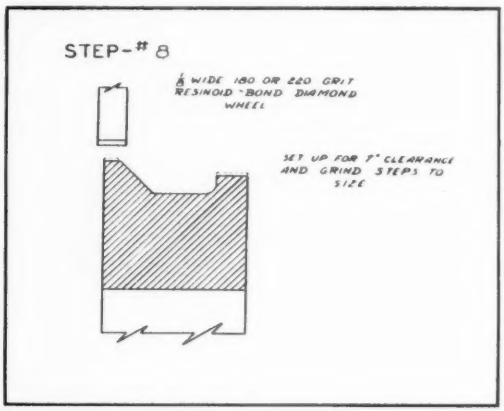
Step 6 is that of clearance grinding the steel shank below the 45° portion of the profile. An aluminum oxide wheel is used and extreme care must be exercised not to touch the carbide with

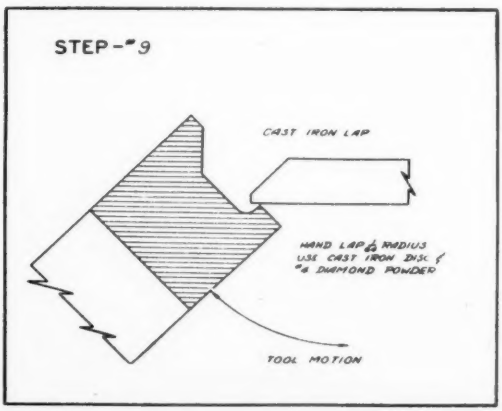

STEP-# 4
⅛ OR ¼ WIDE 80 GRIT-SOFT BOND SILICON CARBIDE WHEEL
FINISH RADIUS BY HAND-LAPPING WITH ⅛ DIA COLD ROLLED STEEL ROD AND #4 DIAMOND POWDER
SET UP ON SURFACE GRINDER, AS IN OPERATION #2, ROUGH GRIND RADIUS FORM RADIUS ON WHEEL BY HAND.


STEP-# 5
⅛ WIDE 180 OR 220 GRIT RESINOID BOND DIAMOND WHEEL
WITH TOOL SET TO GIVE 7° CLEARANCE, GRIND BOTTOM STEP TO BLEND WITH RADIUS
ALSO ESTABLISH 45° ANGLE, HOLDING BOTTOM OF GROOVE TO CORRECT WIDTH. TO DO THIS DRESS A CHAMFER ON CORNER OF DIAMOND WHEEL


STEP-# 6
ALUMINUM OXIDE WHEEL
TO ESTABLISH CLEARANCE TO GIVE A FORM GRIND ON 45° ANGLE. SET TOOL TO GIVE 7° CLEARANCE ON BOTTOM OF GROOVE. GRIND WITH ALUMINUM OXIDE WHEEL DRESSED AT 45° DO NOT GRIND CARBOLOY CONTACT STEEL ONLY


STEP-7
1/8 WIDE 180 OR 220 GRIT RESINOID BOND DIAMOND WHEEL
45°
SET UP TOOL IN GRINDING FIXTURE AT 45° TILT FIXTURE UNTIL SURFACE WHICH WAS GROUND IN OPER'N 6 INDICATES HORIZONTAL SWING FIXTURE ON MAGNETIC CHUCK UNTIL BOTTOM OF GROOVE INDICATES PARALLEL WITH TABLE TRAVERSE GRIND TO BLEND WITH SMALL SECTION ESTABLISHED IN OPER'N 5





this wheel. To insure adequate form clearance for the 45° surface, the tool should be set for 7° clearance on the bottom of the groove and the grinding done with the wheel dressed to 45°.

Step 7 shows the finish grinding of the angle. The tool is set up in the grinding fixture at 45°, the fixture is then tilted until the surface that was ground in Step 6 indicates horizontal. Next, the fixture is swung on the magnetic chuck or rotated about its vertical axis until the bottom of the groove indicates parallel to table travel. Using the 1/8" wide, 180 or 220 grit, resinoid bond, diamond wheel, finish grind the surface to blend with the small 45° section established during Step 5.

Step 8 is that of grinding to size by finish-grinding surfaces "a" and "b" with the 1/8" wide, 180 or 220 grit, resinoid bond, diamond wheel and with the tool set for the 7° clearance angle.

Step 9 is the final operation and involves a cast iron lapping disc charged with #4 diamond powder. By hand the tool is swung as shown to generate a 1/64" external radius blending with radius "D" and surface "b".

By following these sequences and methods of grinding, the great majority of form tools can be readily ground, omitting, of course, any operations which do not pertain to the particular tool form to be produced.

Industrial Digest

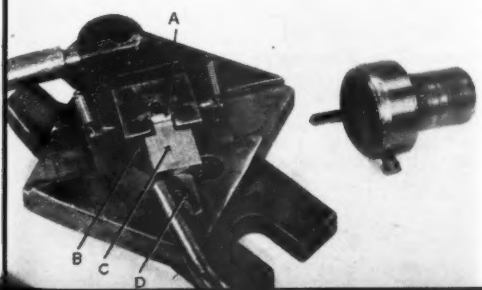
TOOLING•PRODUCTION•WAR NEWS•PUBLICATION REVIEW

Punch Press Substituted for Mill and Drill Operations

By suggesting and developing a punch and die to pierce elongated holes in cast copper branch terminal connectors, Joseph Mizak, a toolmaker at GE's Bridgeport Works, helped speed production of important combat equipment. The job was previously done by drilling a 3/16" hole in the connector and then elongating the hole to 5/16" with an end mill. That method left burrs almost an inch long in some cases, which had to be removed by filing. Mizak's chief purpose in developing his punch and die method was to minimize the burrs, which it did. But his method also proved to be a faster and simpler means of doing the job. Use of the piercing method for the job is particularly interesting because the diameter of the hole is smaller than the thickness of the material and was possible only because the material was soft cast copper. The photograph shows the fixture for punching elongated hole in connector A, set in die B and locked by pusher block C and cam D.

The work is set in a die and locked by a pusher block and a cam-lock arrangement. The operator pierces the hole in one stroke, indexes the cam lock to release the pusher block, and removes the work by indexing another cam lever which actuates a U-shaped, spring-return ejector.

The success of this method led Mizak to develop a second fixture for another job of the same type. This is a broaching punch and die for slotting a cast-copper busbar, previously a milling operation which left burrs that had to be removed by hand filing. In principle and operation, this fixture is similar to the first one. The work is set and locked in the same manner, and removed by a spring-return ejector. The slot, 5/16" wide, is punched through an 11/16" diameter. A five-toothed broach is used because of the short stroke of the presses available for the job. On larger stroke presses, the broach could be designed with more teeth for a lighter cut. The five-toothed broach does not leave burrs, however.



New Plastic Lamp Reflector

Add to the constantly growing list of plastic products the new lamp reflector designed and produced by Taylor Mfg. Company for Vimco Mfg. Company.

There came a time when Vimcolights could no longer be supplied with aluminum reflectors for Taylor sensitive drilling machines—so Taylor plastic engineers set to work to build a reflector of a thermosetting plastic. They made the molds in their own tool and die shop. Materials and methods were experimented with. The reflector was tried on their own machines and when found satisfactory offered to Vimco. These reflectors are now molded

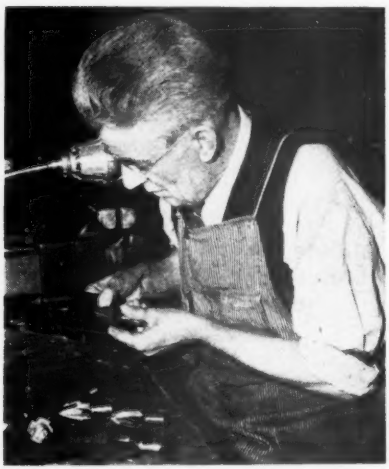
in one operation—threads and all—for ready attachment to the lamps.

As in many other instances, the new product proved superior to the old. It does not retain heat, can be touched with the bare hand after hours of use, does not reflect outside light, compares favorably in cost with metal reflectors.

Idea Increases War Production

A 62-year-old grandfather's idea has made it possible to greatly increase production of steel caps for armor-piercing shot to blast Axis tanks, according to C. L. Van Derau, works manager of the Westinghouse Mansfield, Ohio, plant.

Daniel Bemiller designed a tool which eliminated a drilling operation previously requiring 9,300 hours of work a year, thus freeing workmen to spend this time making thousands of extra steel caps. This tool, a special reamer, shapes the inside of a pointed cap that fits over the nose of antitank shot. It was formerly necessary to use both a reamer and a tool to do the job. In the illustration, Mr. Bemiller inspects a tapered reamer he designed to increase production of the steel caps.



The veteran toolmaker also figured out a way to utilize worn cutting tools used in making armor-piercing shot. He designed an adjustable bushing which makes use of cutters that become shorter than their original length when reground.

Victor Tlach with American Agile Corporation

Victor F. J. Tlach has resigned as President of Darwin & Milner, Inc., Cleveland, Ohio, after occupying that position for nearly thirty years. He is well known as a pioneer of high carbon-high chromium tool steels, having been intimately connected with their original discovery at Sheffield, England, and was prominently identified with their introduction to the United States and their subsequent development. He has joined the American Agile Corporation, 5806 Hough Ave., Cleveland, Ohio, specialists in welding electrodes.

Silver Babbitt Eases Tin Shortage

The creation of silver Babbitt is an outgrowth of the shortage of tin, due to the war. The Battelle Memorial Institute of Columbus, Ohio, deserves credit for exhaustive research to find a Babbitt metal that is comparable to tin-base Babbitts. The ideal was to create a Babbitt that would have the

same bondability and corrosion resistance as that of tin-base Babbitts and which would retain its hardness at operating temperatures without squeezing out. The answer was found in silver alloyed with a properly balanced lead-base Babbitt.

This new Silver Babbitt Metal is now produced by National Bearing Metals Corp., St. Louis, Missouri, with the authorization of the Battelle Institute.

Carman Assumes Charge of PMMA

Frank H. Carman will become general manager of Plastics Materials Manufacturers' Association, Washington, D. C., effective January 1, 1944. Mr. Carman has been with WPB in Washington since 1941. Originally appointed to handle the allocation of neoprene, he was responsible for allocations of all synthetic rubbers and vinyl polymers until August 1943. During this time Mr. Carman devoted considerable time to his work as technical consultant for Chemicals & Allied Products Branch, working with the Coordinator for Rubber of WPB and the Rubber Reserve Co. which was charged with the responsibility of building the new plants as well as determining what types of synthetic rubber to be produced. Prior to the appointment of the Rubber Director he handled all details connected with the synthetic rubber program for WPB. In Aug. 1942 Mr. Carman was appointed Chief of Plastics Section in the Chemicals Division with responsibility for allocations, plant expansions, priority assistance, manpower problems, etc., for thermoplastic, thermosetting and vinyl resins, adhesives and acrylonitrile which is used in the production of synthetic rubber. Prior to his Washington affiliation Mr. Carman was with Armstrong Cork Co. and, before that time, with B. F. Goodrich Co.

A Complete Tooling Service

A pioneer in close tolerance tooling, The McKinney Tool & Mfg. Co. of Cleveland has prepared a four-page "facilities digest" to acquaint postwar planners with the variety and capacity of McKinney services. Currently their efforts are devoted exclusively to war work and the plant is equipped with a full complement of the finest machine tools and close tolerance, optical and mechanical gaging and inspection equipment.

Army-Navy E Awards

According to Paul E. Heller, president, Heller Brothers Co., manufacturers of files and other tools since 1836, the men and women of the Newcomerstown, Ohio, plant of the company were awarded the E flag for high achievement in the production of war materials.

Mr. Donald G. Millar, president of the Greenfield Tap and Die Corp., Greenfield, Mass., announced recently receipt of a letter from the War Department, notifying the company of the addition of a second star to the Army-Navy Production Award originally won in August 1942. The first star award for continued excellence in Production was announced last February.

An Army-Navy "E" pennant has been awarded to the Jessop Steel Company, Washington, Pa., plant for its excellence in war production. Among the praise given to them was a letter from Gen. James H. Doolittle stating that Jessop material was used in the planes making the Tokyo raid.

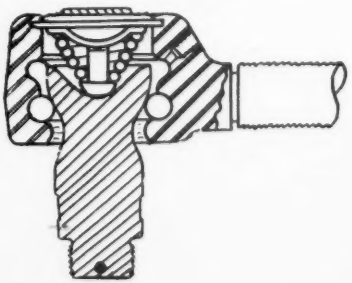
(Continued on Page 186)

IMPROVED BALL BEARING RACE LOADING FIXTURE

As Contributed by
John S. Petreikis
CHIEF INDUSTRIAL ENGINEER
Automatic Transportation Company

THE article in the July 1943 issue of THE TOOL AND DIE JOURNAL, page 131, headed "Loads Ball Bearings Easily," attracted my attention and it was very interesting because we had just such a problem three years ago. We solved our problem in a slightly different manner because we found that balls will lodge in a funnel and that it required jarring or shaking to dislodge them.

We made a rectangular shaped hopper with the front side set in at an angle toward the rear and bottom. Under this hopper is a "magazine" slide with a pattern of holes corresponding to the number of balls required per assembly. The holes are grouped as close together as possible and are $\frac{1}{64}$" larger than the size of ball used. There is a stop at the front and rear end of the slide travel in order to prevent the slide from being overdrawn. The slide can be interchanged with other slides for other quantities of balls as required by different assemblies. Underneath the slide is a plate or shelf having a slot near its front end through which the balls fall into the distributing funnel.



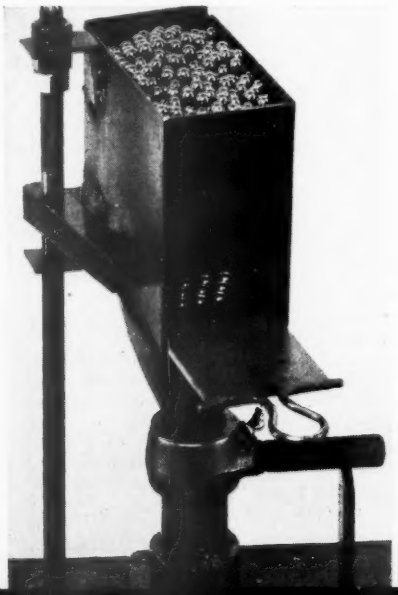
A visual and accurate inspection of the number of balls being dropped into the funnel is quickly realized because the slide does not release the balls until it is drawn out about 2" away from the hopper bottom.

We found that this type of inspection is not as monotonous, fatiguing or eye-straining as an inspection through a small slot.

After the balls are released from the slide, the funnel guides them directly to the work and they fall into the ball race of the pieces being assembled.

If all of the holes in the slide are not filled with balls it is only a matter of pushing the slide back to the stop and redrawing it again, although in the many tests that we made we found that the slide holes are always filled with the proper number of balls with each draw until such time as when there is only one layer of balls in the hopper.

The accompanying photograph and sketch is of our assembly part which requires that twelve $\frac{1}{8}$" diameter balls be loaded in a ball race.



AN INVITATION

The Officers and Directors of the

NATIONAL TOOL AND DIE MANUFACTURERS ASSOCIATION

invite

OWNERS AND EXECUTIVES OF CONTRACT SHOPS WHICH MANUFACTURE SPECIAL TOOLS, DIES, JIGS, FIXTURES, MOLDS, GAGES AND MACHINES

to become

CHARTER MEMBERS

of their Industry's Trade Association; to take an active part in recording the Industry's war tooling accomplishments; to participate in the benefits to be derived from joint consideration of sound procedures to cope with manpower contingencies, industrial taxation and other Governmental wartime edicts.

Charter Membership Rolls close December 1, 1943

Address inquiries to

M. W. ROWELL, GENERAL MANAGER

NATIONAL TOOL AND DIE MANUFACTURERS ASSOCIATION

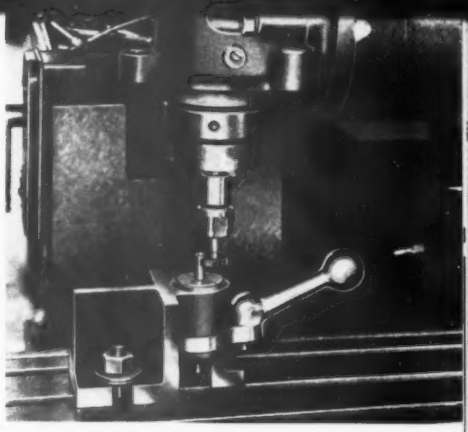
Southern Building · Washington, D.C.

PROGRESS ON PARADE

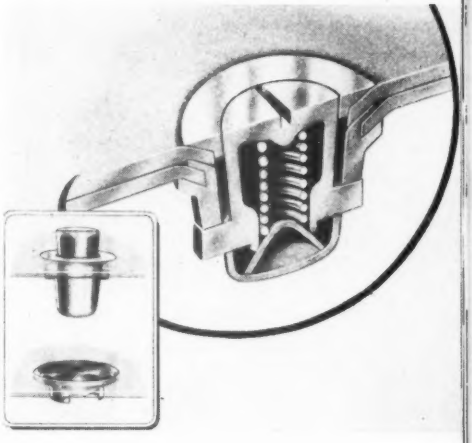
ANOTHER Packer-Matic achievement is the No. 7, primarily used for deburring operations on studs, screws and various special shapes. Its construction is rugged and compact with built-in flexibility for a wide range of sizes. A second head or wheel can be attached for producing multiple operations. Address Packer Machine Co., Meriden, Conn., for further details. **752-E**

A NUMBERING feature designed to eliminate careless disposal of diamonds is announced by the Abrasive Dressing Tool Co., Dept. A, Detroit, Mich., manufacturers of Red Band diamond tools. Tool 15, typical of the cluster-type series, contains 15 fine, whole, natural diamonds arranged in three layers of five each. Clearly stamped on the head of each tool is a series of figures, denoting the number of diamonds in each layer. As the tool is used, the number of diamonds remaining in the tool is indicated through each stage of wear. **753-E**

AN improved design of its Tap Reconditioner just announced by Detroit Tap & Tool Co., 8438 Butler, Detroit 11, Mich., features a new spindle head that accommodates interchangeably a wide range of motor types for the various service voltages, phases and frequencies required in the industry. High rigidity of the spindle head, plus continuous adjustability for grinding tool wear is obtained by mounting the spindle assembly on large dove-tail ways in the pedestal base. **134-E**

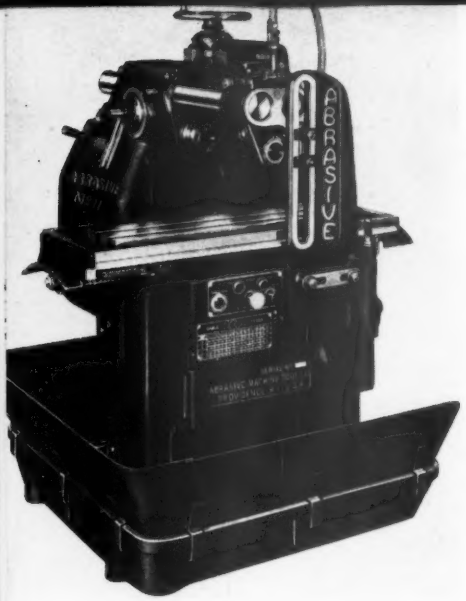


THE Wayne collect chucking fixture provides a convenient and useful means for holding stock in machine operations. It has many unique features, the most unusual of which is that it is sold with jaws undrilled and unhardened to permit drilling to individual and exact specifications. The fixture accommodates stock up to one inch. The locking mechanism is positive and powerful. As jaws are bored slightly under the stock size, a more perfect grip is secured, with the jaws gripping the stock in a complete 360° span. The Wayne Pump Co., Dept. TJ, Fort Wayne, Ind., will send more complete details. **745-E**



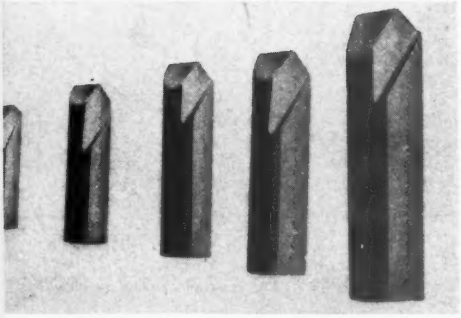
A NEW fastener for aircraft cowlings, inspection plates and protective panels, the Simlok features a helical-type spring which gives long spring travel. This reduces vibration and assures a tight, rigid fit. In tension, the load is not carried by the spring, but by hardened steel lugs, eliminating the load on the spring. Another important feature is the fact that the stud is self-ejecting when it is unlocked and consequently can be readily recognized by the aircraft mechanic as being in that position during repairs or reassembling work. The stud part is also locked semi-permanently in the outer sheet, and thus cannot be lost or mislaid during removal of the cowling. Simmons Machine Tool Corp., Dept. V, Albany, N. Y., will send further details. **464-E**

FROSTRODE coolant coolers are designed for accurate temperature control of coolants and lubricants in machine processing. Carrying away heat as fast as it is generated is obtained by the accurate automatic maintenance of selected coolant temperature by the cooler. Minimum work distortion due to heating in grinding, cutting, turning and other operations is possible. The coolers are adaptable to a wide range of machines, operations and processes. Features include: Uninterrupted streamline flow for high efficiency; auto-



matic compensation for room temperature; operates independent of other coolers. Frostrode Products, 1903 John R, Detroit 3, Mich., has current literature available. **66-E**

THE B-11 abrasive milling machine is a manufacturing-type unit with complete electrical control for table and spindle power movements. Its capacity is ample for most work of medium size for efficient production milling. The B-11 has a built-in backlash eliminator on the table screw which is released automatically during fast travel. This permits climb milling in either direction up to the capacity of the driving motors. Other outstanding features announced by Abrasive Machine Tool Co., East Providence, R. I., include automatic reverse, fast table travel of 300" per minute and an unusually wide selection of feeds and speeds. **754-E**



A LINE of solid round Kennametal tools already ground ready for immediate use in precision boring machines is announced by Kennametal Inc., 500 Lloyd Ave., Latrobe, Pa. These tools are designated as the 27SR, having a side cutting edge angle of 30° and an end cutting edge angle of 38° for use primarily in a 30° boring bar; and the 29SR having corresponding angles of 45° and 53° for use primarily in a 45° boring bar. The tools are stocked in grades K3H and K4H, ready for delivery. **33-E**

CARBLOX, a new development in the manufacture of cemented carbide gage blocks to reduce wear error in their use has been announced by Lincoln Park Tool & Gage Co., Dept. J, Lincoln Park 25, Mich. Carblox are practically nonmagnetic and highly resistant to rust or corrosion. Their high cohesive factor facilitates the wringing of thin blocks. Used on each end of a build-up, they act as protective anvils and prevent wear on the less wear-resistant steel blocks. These blocks are furnished to "A" accuracy (.000004") and "B" accuracy

(.000008") as a series of a gage block build-up or as individual blocks when a build-up is not required. **368-E**

AN instrument for precision measuring internal and external dimensions has been developed by The Sheffield Corp., Dept. JD, Dayton, O. As an internal dimension comparator, the Electrigage can be used for checking master and working ring gages, for setting snap and length gages and for other similar high precision work. It will check dimensions from 3/4" to 12" and explore a hole to a depth of 3". When used as an external comparator, it will check rounds, straights and tapers within a maximum dimension of 12". This is one of the few instruments on which the small diameter of a taper can be easily and precisely checked. The scale of the Electrigage has a range of .0012" and is graduated in 50 millionths of an inch (.000050"). These graduations are spaced far enough apart so that interpolated readings of approximately .0000125" are possible. **24-E**

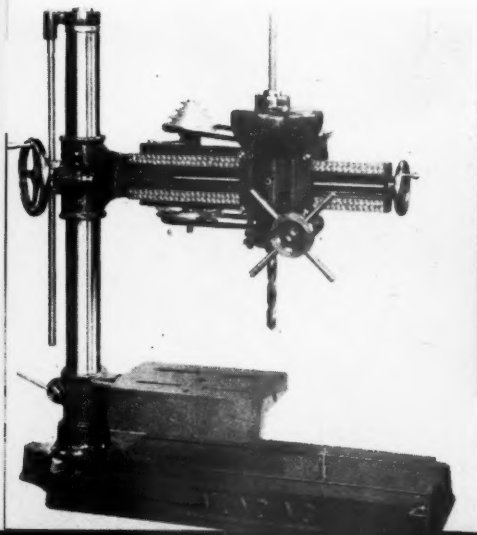
THE George Scherr Co., 128-B Lafayette St., New York 13, N. Y., announces that henceforth all Reed Micrometers in the 1", 2" and 3" sizes will be automatically furnished with a vernier enabling quick and easy readings to 1/10000". There will be no extra charge for this added feature. **490-E**

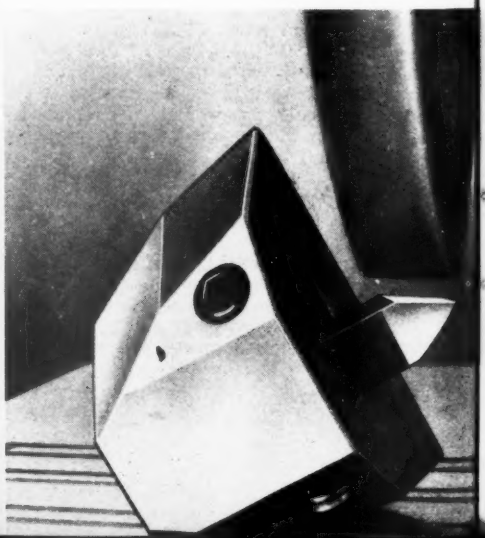
CARBUR, INC., Lincoln Park 25, Mich., announces the addition of six new tools to their standard lines of cemented-carbide rotary files. These are available in three shapes, each of which is furnished in two sizes. The new shapes are illustrated with the two ball end types originally introduced to the trade. All of these tools have cutting teeth ground from the solid. As they provide a sharp cutting edge over a long period of time, they reduce burring time per part and generally increase efficiency in burring operations in all types of production. Tool sharpening is reduced in proportion to the life of the tool. **119-E**

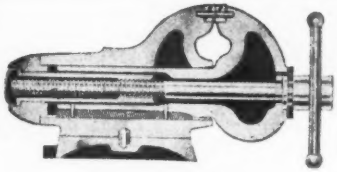
THE new Shape Rite shaper (left) is specially designed for high speed, accurate shaping where a fine finish is desired. Extra long ram-ways (Vee type), precision cut and lapped gears, ground and hand-scraped working surfaces allow fast operation, up to 160 strokes per minute, without deflection, back-lash or vibration. All levers and controls on the shaper are conveniently located on the operator's side of the machine, thus enabling the unit to be set up and operated very easily. Sales Service Machine Tool Co., 2428 University Ave., St. Paul 4, Minn., will send literature on request. **452-E**

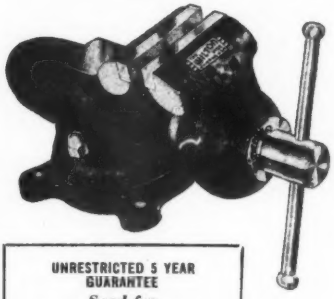
THE new improved radial drill (below, left) combines the convenience and accuracy of a sensitive drill, and the range and capacity of a large drill with the speed and flexibility of a radial. Munding is the "all ball bearing" radial; bearings are dust-sealed and lubricated for life at the factory. The spindle, spindle sleeve and column are precision ground and pulleys of high grade aluminum are machined from the solid. Write Munding Manufacturing Co., 707 E. Colorado Blvd., Glendale, Calif., for full particulars. **805-E**

THE Robert H. Clark Co. of Los Angeles have recently announced the development of a new thread tool grinding fixture (below) that eliminates guesswork, insures accuracy, uniformity and precision in grinding both 60° and 29° thread tool bits. The machinist merely slides the bit into the holder, tightens the set-screw and places the fixture on the grinder work table, positioned for the thread angle desired as indicated on the fixture. The bit is thus securely held automatically and precisely at the desired angle to the grinding wheel. The fixture is available in two standard sizes, each of which takes all tool bits within a ⅛" to ⅝" range. For full information write Robert H. Clark Co., 3424 Sunset Blvd., Dept. TJ-10, Los Angeles 26, Calif. **92-E**









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SOMETHING REALLY NEW IN BENCH VISES

- INDESTRUCTIBLE
- INTERCHANGEABLE JAWS
- NO SIDE TWIST OR WOBBLING
- PRECISION GUIDED STEEL KEY (at base)

SIZES AND PRICES
(Subject to Discount)

Width of Jaws	Maximum Opening	Approx. Weight	Price Without Swivel	Price With Swivel
2"	2"	10 lbs.	———	$10.40
3"	4½"	19 lbs.	$10.50	12.80
4"	5¼"	37 lbs.	16.40	18.60
4" Heavy Duty	7"	48 lbs.	17.90	21.00
4½"	5½"	40 lbs.	19.10	21.30
4½" Heavy Duty	8½"	55 lbs.	23.00	27.50
5"	8½"	58 lbs.	28.00	33.60
6"	9½"	106 lbs.	48.50	62.00

Extra Jaws Available

	2"	3"	4"	4½"	5"	6"	
Smooth, Precision Ground Steel, Hard or Soft...	$1.65	1.90	2.85	3.30	4.40	5.50	pr.
Brass or Copper, Smooth.....	2.00	2.20	3.10	3.65	5.50	6.45	pr.

Sizes 3", 4" H. D., 4½" H. D. and 6" are built to conform to Federal Specifications GGG-V-436 as required by Army, Navy, etc.

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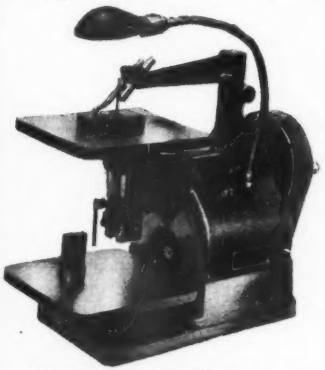
TWO MACHINES IN ONE FOR DIE FILING

Use Top Table as Shown

FOR PUNCH AND BLIND HOLE FILING

Tilt top table back. Use lower table



ADJUSTABLE STROKE 0" to 1½"
ADJUSTABLE SAFETY FRICTION DRIVE

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ANGLEMASTER SINE VISES

No. 2 TILTS ONE WAY SAME AS SINE BAR

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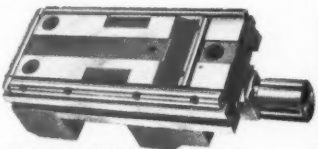

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Features Include:

1. Precision Sine Rolls
2. Non-Projecting, fully covered, Telescoping Screw
3. Removable Grip Screw Knob
4. Prismatic Slide Jaw
5. Accurate Integral V-Block
6. Tolerance .0002"

WRITE FOR CIRCULARS

IDEAL TOOL and DIE CO., INC. - 735 CONGRESS STREET SCHENECTADY, N. Y.

Publication Previews

SALES AND TECHNICAL LITERATURE

Send Request on Company Letterhead

THREE DIFFERENT TYPES OF parts can be cleaned at one time with the new triple baskets in the L & R industrial precision cleaning machine discussed and illustrated in a leaflet issued by the L & R MFG. CO., 59 Clinton St., Newark, N. J. These portable L & R machines clean, rinse, polish and dry small parts to highest inspection standards. **352-E**

"LIKE PEAS IN A POD"—compact and neat —Ideal "Wire-Nuts" speed plant wiring changes, maintenance, additions and repairs as described and illustrated in a four-page bulletin issued by the IDEAL COMMUTATOR DRESSER CO., Dept. D, 1287 Park Ave., Sycamore, Ill. No blow torch or soldering iron is needed—just strip the wire and thread the "Wire-Nut" onto the wire like you put a nut on a bolt. "Safe-T-Grip" Fuse Pullers are described and illustrated in another bulletin. They eliminate the danger of pulling and replacing cartridge fuses by hand, and handling other "live" electrical parts. **329-E**

PEDESTAL MICROMETERS and Pedestal Indicators are described and illustrated in a four-page leaflet issued by the BARTELT ENGINEERING CO., 1214 Partridge Ave., Beloit, Wis. These handy gages are useful for a number of common shop operations such as setting of cutting tools in boring bars, for milling machine and planer setups, as a height gage or depth gage and for various layout and inspection jobs. **712-E**

A HANDY four-page booklet illustrating and describing Diamond Impregnated Dressing Tools engineered by the WHEEL TRUEING TOOL CO., INC., 3200 W. Davison, Detroit, Mich., has just been issued. These economical, free cutting and non-glazing diamond dressers are recommended for use on external, internal, centerless and surface grinders. This is a second of a series of booklets illustrating and describing the complete line of Diamond Tools developed and manufactured by this company. **522-E**

CORRONIZING, the rust-proofing of steel, is explained in a pocket-size booklet issued by the STANDARD STEEL SPRING CO., Corronizing Div., Dept. T, Park Bldg., Pittsburgh, Pa. Corronizing will mean many additional years' use for household articles which heretofore have been rendered unfit by rust after varying periods of use. Lawn mowers, wash tubs, drain pipes, hot-water heaters, furnaces and many other commonplace articles will last as much as four times longer when corronized. **751-E**

A BOUND SET of twelve bulletins on broaching equipment for all types of broaching has been issued by the LAPOINTE MACHINE TOOL CO., Dept. TD, Hudson, Mass. Detailed discussions along with illustrations and specifications of hydraulic powered, vertical and horizontal, variable speed broaching machines, broach sharpening machines, pumps, and "Rotor Kut" broaches are presented. **714-E**

AN AUTHENTIC 56-page guide-book on nonferrous alloys has been published by the FRONTIER BRONZE CORP., Dept. TDJ, Niagara Falls, N. Y. By referring to this handy book you can make sure of selecting the exact alloy indicated by the nature of each particular job. **755-E**

TOOLS EVERY SHOP NEEDS is the title of an 8-page bulletin issued by the PRODUCTO MACHINE CO., 995 Housatonic Ave., Bridgeport, Conn. The Producto Universal Shaft Vise has three machined bases so that the Vise can be mounted on a machine tool vertically, horizontally or on end for Universal application. Their machine vises for every purpose are available in 9 types and 13 sizes and their adjustable angle plates are available in 3 sizes. **91-E**

A GENERAL catalog of specifications and stock of THE BISSETT STEEL CO., 952 E. 67th St., Cleveland, O., has recently been issued. Particular attention is directed to the technical data and charts showing typical and chemical properties of alloy steels. **603-E**

"COLOR-BRANDING" in accordance with a color chart has been adopted by the FIRTH-STERLING STEEL CO., Dept. J, McKeesport, Pa., as the best means of selecting Firthite Sintered-Carbide Tips and Tools so that the user can easily determine the grade of carbide at a glance. The unmounted Tips are color-branded on the outer end and, after brazing, the operator paints on the tool shank the color that appeared on the Tip before it was brazed. The handy Firthite Color Chart is available to users on request. **10-E**

A COMPLETE line of general machine lights which lessen eyestrain and reduce fatigue are discussed and illustrated in a four-page leaflet issued by the VIMCO MFG. CO., INC., 114 Chenango St., Buffalo, N. Y. Evidence of the success of "Vimcolight" in solving industrial lighting problems is shown. **116-E**

AN ILLUSTRATED bulletin, E 843, describing the Universal Slotmaster, containing detailed information regarding three conventional, seven special setups and an automatic attachment, has just been issued by the Special Machinery Div. of the EXPERIMENTAL TOOL & DIE CO., 12610 Greiner Ave., Detroit, Mich. This Slotmaster saves tooling cost and setup time and can be adapted to any round or flat-on-round overarm milling machine. **61-E**

A CONVENIENT, easily operated "One Man" lifting device which reduces fatigue and increases production is one of the exclusive features discussed and illustrated in an interesting 24-page booklet issued by the K. R. WILSON CO., 15 Lock St., Buffalo, N. Y. This and many other exclusive features on the KRW hand operated Hydraulic Arbor Presses make them outstanding in design, construction and performance. **529-E**

FACTS ABOUT Por-os-way, the new discovery in grinding wheels, are discussed and illustrated in a pocket-size booklet issued by A. P. DESANNO & SON, INC., Dept. T, Phoenixville, Pa. The aerated structure of the Por-os-way wheel cools each grinding point between contacts and has little tendency to confine and retain heat. The strong new vitrified bond enables the wheel to hold its corner even on the deepest cuts and requires only a minimum of dressing. **262-E**

AN ATTRACTIVE new catalog, No. CW-41A, entitled, "Design and Rating of Cone-Drive Worm Gearing," has been issued by the Cone-Drive Div. of MICHIGAN TOOL CO., 7177 E. McNichols Rd., Detroit, Mich. The design characteristics, applications, tool charts and horsepower ratings of the various units for which tooling is now available are detailed. A chart listing the standard speed reducers manufactured is also included, as well as standards for worms, bearing carriers and caps, gears and spiders. **47-E**

"INDUSTRIAL DESIGN"—the key to post-war products, is explained and illustrated in a brochure issued by THE DOUGLAS T. STERLING CO., 505 Fifth Ave., N. Y. C. Market analysis, new product ideas, new materials and methods, product development, engineering, finance and merchandising, the seven basic steps in new product design, are fully covered. This should prove of value to those who are interested in the analysis and design of their products for the highly competitive post-war market. **719-E**

PRECISION EQUIPMENT for the tool and machine industries is described and illustrated in Catalog No. 836 just released by THE CHALLENGE MACHINERY CO., Dept. D, Grand Haven, Mich. This includes time-saving devices for tool and machine shops and precision equipment for layout, inspection, assembly and general production. Specifications and illustrations are given of layout surface plates, angle plates, reading and checking tables, turn tables, work benches and other helpful equipment. **431-E**

A UNIQUE portfolio, presenting the "4 Spheres of Service to American Industry," has been issued by MERZ ENGINEERING CO., Dept. J, Indianapolis, Ind. These services include an experimental engineering, research and

development service; a standard gage department manufacturing a complete line of standard AGD plain and threaded plug and ring gages; a tool division devoted to the design and production of special gages, jigs and fixtures and a fully-equipped machine shop for the manufacture of special parts. **720-E**

GREATER ACCURACY, longer life, heavier load capacity and faster production are attributed to the Empire Live Center described and illustrated in a leaflet issued by the KING PRODUCTS CO., 73 Spring St., N. Y. C. This precision Live Center with replaceable point has been designed for tool room tolerances. By using interchangeably the various taper seat points many different operations may be handled with the same live center. The Fisher Tool Co. of N. Y. C. is one of the distributors of this versatile aid to production. **721-E**

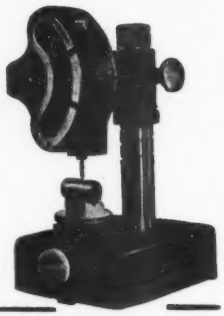
AN ATTRACTIVE 45-page booklet entitled, "Accounting and Control Manual," is now offered by THE COOPER-BESSEMER CORP., Dept. T, Mt. Vernon, O., to those interested in furthering their knowledge of principal methods and procedures essential to plant operation. Operations of the company's machine shops, foundries and assembly floors, with detailed descriptions of the methods used for controlling engineering design, ordering, recording and storing materials, purchasing, timekeeping and inspection, production, payroll and inventory are discussed. **85-E**

IMPORTANT features, specifications, load rating tables and dimensions describing the Ransome line of welding positioning equipment is presented in a new four-page bulletin, No. 201, just released by the RANSOME MACHINERY CO., Dept. T, Dunellen, N. J. **437-E**

AMIC COMPARATOR

★

A Precision Indicating Gage



Our extensive experience will solve your measuring problems

DESIGNED to replace special gages, flush pin gages, snap, height gages. For accurate, convenient and quick checking of components, either in the tool room or on the production line. Permits precise gaging throughout the whole day without eye fatigue. Each division of the scale represents 1/10,000th of an inch. Interpolations of .00005 easily achieved. Clear readings on 6" scale with inch and millimeter readings. Magnification is 1000. Measuring capacity is ±.003" and ±.05 mm.

Accessories

NOTE our improved list of accessories designed to suit your particular measuring problems. Thread measuring device, serrated anvil, vee-blocks, centering fixture, ball anvil and several types of backstops.

AMERICAN MEASURING INSTRUMENTS CORP.

240 West 40th Street **New York, N. Y.**

MANUFACTURERS OF GAGES, JIGS, FIXTURES AND SERVICE TOOLS

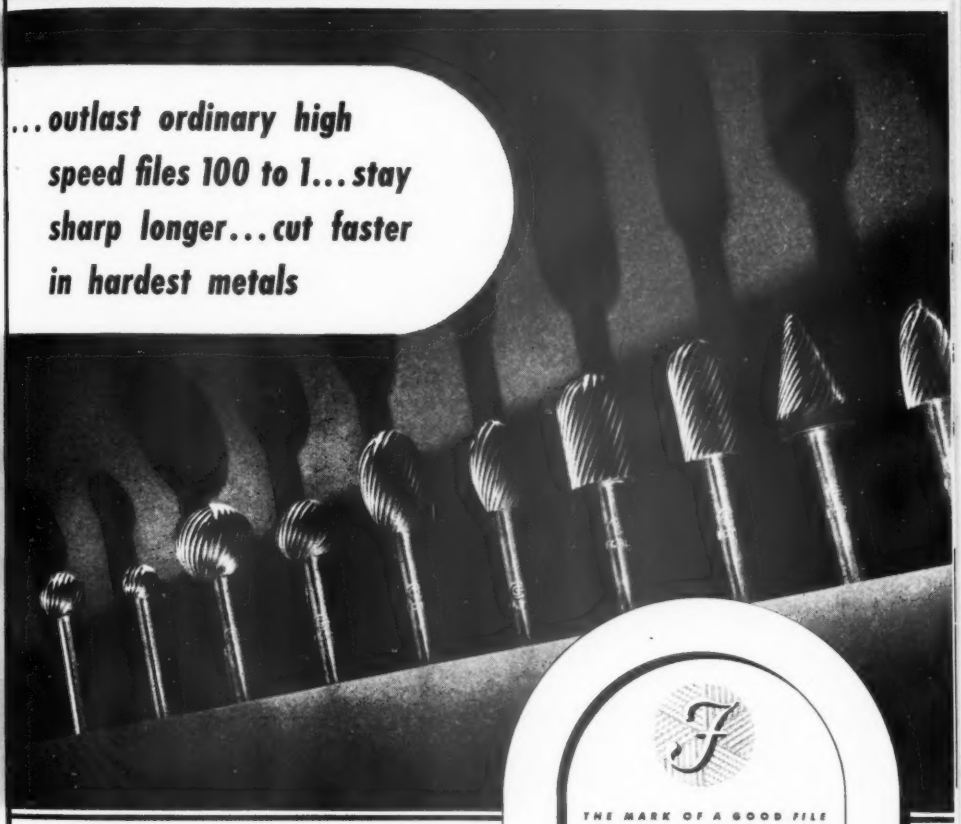
THE ADVANTAGES, APPLICATION and properties of hard-facing, the welding by melting of a hard alloy overlay or coating to steel or iron surfaces, edges, or points of machinery or equipment that is exposed to wear, abrasion, impact and heat, are discussed in a 12-page booklet issued by COAST METALS, INC., Dept. J, 1237 Camden Ave., Canton, O. Longer equipment life, fewer shut-downs and conservation of critical metals are a few of the advantages given. **244-E**

A SIMPLIFIED GUIDE to Bakelite Plastics has been published by the BAKELITE CORP., 36 E. 42nd St., N. Y. C. The purpose of this booklet is to answer the many questions in the businessman's mind about modern plastics. Various types of Bakelite Plastics and their possibilities for increasing sales and profits are described. Colorful illustrations show the opportunities offered by Bakelite Plastics for attractive product styling. **722-E**

(Cont'd on P. 150)

NEW CARBIDE CUTTERS

...outlast ordinary high speed files 100 to 1... stay sharp longer... cut faster in hardest metals



NOT for ordinary filing needs, but for jobs and metals that require faster cutting, harder biting rotary files, Ford Carbide Cutters come as the answer to a long existing need. Carbide Cutters give you 100 times longer life, and retain their diamond ground cutting keenness—and thus their original shape and size—vastly longer. A precision, more economical file for high production output, in every respect. Now available in 10 sizes and 5 shapes. Write for special catalog and full details of production advantages. M. A. Ford Manufacturing Company, Inc., 739 W. First St., Davenport, Iowa.

THE MARK OF A GOOD FILE

FORD

Ground from Solid
ROTARY CUTTERS

Hand Cut
ROTARY FILES

(Continued from Page 148)

A CONVENIENT, 16-page, pocket-size booklet entitled "Preventing Welding and Cutting Fires" has been issued by the INTERNATIONAL ACETYLENE ASSOC., Dept. J, 30 E. 42nd St., N. Y., to instruct users of welding and cutting equipment in reducing potential fire losses. This booklet contains concise discussions of the chief causes of fires and practical, common-sense measures for preventing them. It should prove of value to every welding and cutting operator. **723-E**

THE LATEST price list of WILLEY'S CARBIDE TOOL CO., 1350 W. Vernor Highway, Detroit, Mich., is contained in Bulletin 143 just issued by the company. It covers all grades and classifications of Willey's Metals, and gives prices on their Standard cutting tools, standard blanks, solid tungsten carbide for boring tools and Willey's tungsten carbide center inserts. **551-E**

THE PENTRATE PROCESS, a patented process that applies a protective, penetrating finish to steel, is discussed and illustrated in an attractive booklet issued by the HEATBATH CORP., Dept. J, Springfield, Mass. Rich, deep black in appearance, the Pentrate finish is obtained at low temperatures through chemical action and is substantially durable and rust resistant. A few of the products now being Pentrated are aircraft parts, bolts, compressors, drills, gages, milling cutters, pneumatic tools and typewriters. **724-E**

Special Springs
GIBSON-SPRINGS
FOR DIES and TOOLS
Write
If you want a more dependable source of supply in these troubled times, or assistance on some problem involving springs—get in touch with us. 65 years specialized experience.
WILLIAM D. GIBSON COMPANY
1800 Clybourn Ave., Chicago, Ill.
(DIVISION OF ASSOCIATED SPRING CORPORATION)

APPLICATION SUGGESTIONS, product descriptions and technical data about the Valdura line of Heavy Duty Industrial Maintenance Paints are now listed in a new catalog just issued by the AMERICAN-MARIETTA CO., 49 E. Ohio St., Chicago, Ill. The Maintenance man or purchasing agent can plan his paint requirements and know the characteristics of drying, coverage and application by using this handy ordering catalog. **725-E**

POSSESSING EXTREME hardness, low friction, stability of temper and low melting point and the ability to bond homogeneously with practically any other metal, Kerk-Aloy has unlimited use as a hard overlay metal in machinery and tools, both used and new as described in a leaflet issued by the KERK-ALOY CO., Dept. F, Bloomington, Ind. The applications of this hard overlay metal to machinery manufacture, food processing, steel mills, electric power plants, coke and gas plants and many other fields are discussed. **726-E**

(Cont'd on P. 152)

New KRW HYDRAULIC PRESS BULLETIN *Now Ready!*

Typical pages from the new KRW Hydraulic Arbor Press Bulletin.

Not only a complete catalog of the full KRW Arbor Press line, but an "idea book" for production men. Describes many new attachments, fixtures and special presses developed by KRW to speed war production. Illustrates the new 60-ton KRW Hydraulic Press, the 25, 50 and 75-ton sizes, and KRW Bench Type Arbor Presses in 1/2, 1 and 3-ton capacities. Write for your copy today!

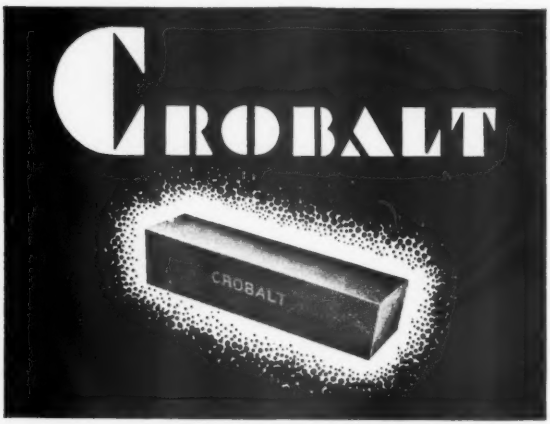
K. R. WILSON
10 LOCK ST., BUFFALO 2, N. Y.

(Continued from Page 150)

AN ECONOMICAL, efficient method of controlling and removing industrial dust is described in a new 8-page bulletin entitled, "Dust—The Silent Saboteur of Production"—recently published by the AMERICAN FOUNDRY EQUIPMENT CO., 561 S. Byrkit St., Mishawaka, Ind. The dust hazards to production, precision machinery and workers are introduced with recommendations for the removal of dust at its source with their efficient Dustube bag type dust collector. **730-E**

THE MODERN METHOD of Sump Tank Cleaning is discussed and illustrated in a circular issued by the W. R. CARNES CO., 2073 Helena St., Madison, Wis. The "speedy 'Carnes' cleaner way" removes all sludge, old oil, coolant and chips in less than 10 minutes by thorough cleaning—excessive wear on circulating pumps on machine tools is eliminated. **728-E**

A NEW AND COMPLETE treatise showing methods and devices for bending pipes and tubes of copper and its alloys has been published by the COPPER & BRASS RESEARCH ASSOC., 426 Lexington Ave., N. Y. C. It contains 80 pages of text with 113 figures and illustrations including 35 full pages of unit weights of tubes of different alloys with varying diameters, wall thicknesses and shapes, as well as pertinent information on the chemical and physical properties of such pipe material. Hot and cold bending, minimum radii, temper, the use of mandrels of various types and many other essential factors are outlined. **729-E**



A NON-FERROUS HIGH SPEED CUTTING ALLOY WITH THESE ADVANTAGES:

- **Hardness at high temperature**
- **Superior abrasion resistance**
- **Superior resistance to impact**
- **Freedom from chipping**
- **Available in solid tools or inserts**
- **Requires no change in equipment**

Write for catalog and prices.

CROBALT INC.
ANN ARBOR, MICH.

"THE MULTIVAL SYSTEM," an improved method of providing positive lubrication to a group of bearings from a central distributing block, is described and illustrated in Bulletin No. 15 issued by the FARVAL CORP., 3298 E. 80th St., Cleveland, O. By making a single connection the operator can deliver an exact measured charge of lubricant to as many as 10 bearings at a time. **413-E**

ANGLE DRILLING ATTACHMENTS, for use with portable electric and pneumatic tools, are discussed in an attractive booklet issued by GEORGE A. TERRY CO., Dept. D, Buffalo, N. Y. They have been developed to meet a demand for accurate, durable tools to get into those difficult, close places in airplane construction. The handles and front bearings of all Terry geared type Angle Attachments have left hand threads. **731-E**

(Cont'd on P. 154)

SUNNEN HONING

Provides a finish of 2 to 3 micro-inches—

Battery of 6 Sunnen Precision Honing Machines in completely air-conditioned room — honing to .0001" tolerance.

and at a Saving of

35% in time!

Accuracy — and a super-smooth finish with a real increase in production which means a saving in cost. That's the record of the Sunnen "MA" Precision Honing Machine in the modern plant of the Fidelity Machine Company.

Consider These Advantages

Wide range—handles internal diameters of .185" to 2.625". Accuracy within "one-tenth" guaranteed — has been held to .000025" on production jobs. Relieves big internal grinders for other jobs. Corrects errors of out-of-roundness or taper caused by previous operations. Facilitates duplication of sizes. Does not require skilled labor. Practical — inexpensive — economical to operate.

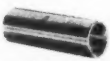
Put Sunnen Honing to work in your plant!

The coveted Army-Navy "E" waves over the Sunnen plant—evidence of the important part Sunnen equipment is playing in the war effort.

Aircraft Instrument Panel Control Wire Bushing. Hole .187" diameter — held to .0002", stock removal .001", sixty per hour.

Header Die. Life of header dies increased 3 to 9 times over lapping. Knock out pin breakage practically eliminated.

Aircraft Hydraulic Brake Cylinder. Honing 3 times faster than lapping—and gave a straighter hole.



Aircraft Piston Pin. Sunnen honing is twice as fast and gives a cleaner, better looking pin.

Cast Iron Valve Stem Guide. $\frac{1}{2}$ to one thousandth removed—220 pieces per hour. Better finish and straighter hole.

Aircraft Valve Tappet Roller. Honed after grinding to give 100% bearing surface.

SUNNEN

Sunnen Products Company

7947 Manchester Ave., St. Louis, Mo.

Canadian Factory; Chatham, Ontario

(Continued from Page 152)

"A MECHANIC CAN BE no better than his tools" states a 47-page pocket-size booklet just released by the GEORGE SCHERR CO., INC., 128-B Lafayette St., N. Y. C. Its pages briefly outline the Scherr Limited Budget Inspection Laboratory and other tools and aids to production. The Scherr Comparitol, Inspection Unit, Gear Tester, Ultra-Chex Inspectoset, Wilder Micro-Projector, Toolmaker's Microscope and other precision equipment are described and illustrated. **490-E**

TOOL BITS, center drills, woodruff key seat cutters, slitting saws and lathe mandrels are illustrated in an attractive booklet issued by the TRU-CUT TOOL CO., 14240 Birwood Ave., Detroit, Mich. They also manufacture forming tools both of the flat and circular type. **703-E**

TWO circulars describing and illustrating Benchmaster milling machines and presses have been issued by the BENCHMASTER MFG. CO., 2958 West Pico St., Los Angeles, Calif. The vertical milling machine pictured is easily converted for horizontal milling by simply interchanging the spindle attachments. The four-ton press, a high-speed machine, ideal for handling light sheet metal, plastics, etc., stamps, crimps, marks, punches, rivets, and forms many special shapes. **169-E**

MODERN MACHINE vises for machine tool tables are described and pictured in an 8-page folder issued by the PRODUCTO MACHINE CO., Dept. D, Bridgeport, Conn. The Bay State Tool Room Vise, a modern and accurate tool room vise, is suitable for tapping, drilling, grinding and jig boring operations. **91-E**

TWO SPINDLE
Adjustable
DRILL HEADS
Drill Two Holes At Once

✓ *Adjustable Centers from ½" to 6"*

✓ *Drill Capacity 0 to 5/8"*

Sleeve and overarm types . . . in several sizes. Will double output of any single spindle drill press.

Quickly adjusted to desired drill centers from ½" to 6".

Send for bulletin.

LINDERME MACHINE & TOOL CO., INC.
12250 Coyle Ave., Detroit 27, Mich.

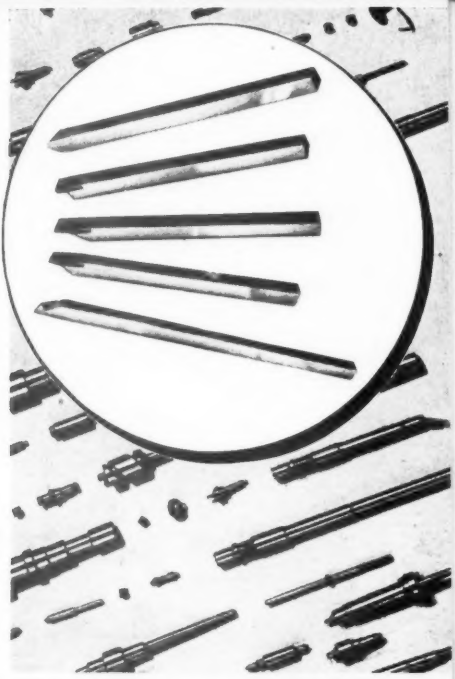
A NEW IDEA in vibrating reed frequency meters is the title of a recent bulletin issued by J-B-T INSTRUMENTS, INC., 448 Chapel St., New Haven, Conn. Because of their new and exclusive features, these frequency meters are being used extensively on engine-generator sets—in laboratories—in telephone, television, and radio service—in many types of electronic equipment—on panel and control boards in central stations and industrial plants and other applications. **732-E**

INDUSTRIAL AND AUTOMOTIVE reamers are discussed in two leaflets issued by the EVANS REAMER & MACHINE CO., 4546 Ravenswood Ave., Chicago, Ill. A chart of sizes and prices is included in each leaflet. The industrial reamers are especially desirable for line reaming in machine assembling. Extensions and pilots can be made any length. A full bearing surface is obtained and no after honing is required by the use of Evans automotive reamers. **733-E**

(Cont'd on P. 156)

SIMPLE

STANDARD, LOW-COST TOOL BITS DO ALL JOBS *like these...*



WIDE RANGE OF WORK
Turns any diameter from .005" to 7/16" Bar Capacity of Machine

GORTON 16-A produces the most complex precision parts with only the simplest single-point tool bits—either high-speed steel or carbide-tipped.

SIMPLE

SET-UPS...ADJUSTMENTS... OPERATION .... All vital parts and controls instantly accessible—insures simple, quick, low-cost set-ups. Centralized fingertip controls provide infinitely variable spindle speeds and cam feeds—no speed or feed gears to change. Extreme accuracy and exceptional finish assured; subsequent finishing operations usually eliminated.

PRECISION PARTS COMPLETE IN *1* OPERATION

The Gorton 16-A produces an almost endless variety of short or long slender parts — simple or complex — complete in one operation. It does step and contour turning and chamfering in multiple diameters—centers, drills, threads, slots —tapers...knurls...back recesses...pivot points...etc.

OUR GOLDEN ANNIVERSARY 1893-1943

GEORGE GORTON MACHINE CO.
1319 Racine St., Racine, Wis.
Send me, without obligation, FREE bulletin with complete information covering the Gorton 16-A Precision Automatic Screw Machine.

Name.....*Title*.....
Company.....
Address.....
City.....*State*.....

GET THE FACTS NOW

Mail Today for FREE Bulletin

GEORGE GORTON MACHINE CO.
1319 RACINE STREET, RACINE, WISCONSIN, U.S.A.

(Continued from Page 154)

DESIGNED ESPECIALLY to enable operators when sharpening thread milling cutters, gear hobs, etc., to rapidly and accurately check whether or not the cutter has been ground to the correct angle of hook or rake and flute spacing is the new Detroit Universal Hook Checker, described and illustrated in Bulletin No. HC-43, just released by DETROIT TAP & TOOL CO., 8437 Butler Ave., Detroit, Mich. A detailed description of the Hock Checker, full instructions on how to operate for checking hook or off-set and flute spacing, complete specifications of the machine and a section containing valuable suggestions on sharpening thread milling cutters completes the folder. **134-E**

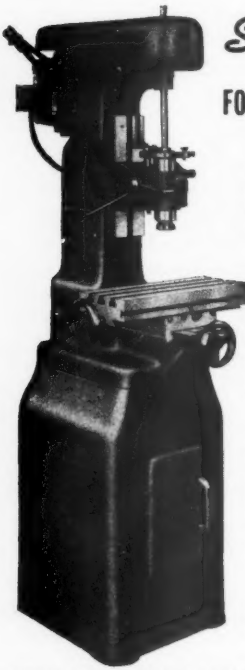
INDUSTRY'S FIRST cemented-carbide rotary files are described and illustrated in a four-page leaflet issued by CARBUR, INC., 941 Southfield Rd., Lincoln Park, Mich. Because of their wear-resistance, less replacement is necessary and inventories of rotary files can be reduced considerably. These rotary files, supplied in coarse, medium and fine cut, produce more efficient finishing and require less sharpening. **119-E**

A NEW STEEL hardening solution which simplifies the heat treating of tools and steels and improves the pearlite texture of the steel is described in a pamphlet issued by the STEELTEM CHEMICAL CO., 56 E. 42nd St., N. Y. C. Steel-temp hardening solution also hardens tools where the maker specifies oil quenching treatment This special formula chemical solution works well with either water or oil quenching steels. **734-E**

GREATER PRODUCTION, IMPROVED QUALITY and the reduction of welding costs are a few of the advantages of the Frostrode System as described and illustrated in Bulletin No. F-43 issued by FROSTRODE PRODUCTS, 19009 John R St., Detroit, Mich. The "Frostrode" process was developed to overcome the difficulties ever present in the welding of aluminum and heavy steel sections. It is a complete low-temperature electrode cooling system which comprises Frostpoint permanent electrodes with replaceable Frostcaps, plus Frostpoint adaptors, plus engineered-to-the-job Frostrode refrigerating units. These enable the scientific application of the process to any resistance welder. **66-E**

CUTTING tools, made to customer's blueprints only, for use in precision high production are described and illustrated in a four-page leaflet issued by the AMERICAN CUTTER & ENGINEERING CORP., Dept. J, Warren, Mich. **639-E**

(Cont'd on P. 158)



Save YOUR "HEAVIES" FOR THE BIG GAME

It's more productive to let the fast little fellow carry the ball some of the time than to wear out the "big heavy" in all plays . . . both football and industry.

The Linley high speed Jig Boring and Milling machine is a case in point. It saves power, wear and time by taking on a great variety of rush jobs in machine shop and tool room, freeing larger machines for work better suited to their higher capacities.

"A speed for every need"—8 of them, 275 to 4250 r.p.m. and the versatility for quick changeover, simplify operations in precision die work, jig, metal pattern and model making, with maximum tool protection and low cost.

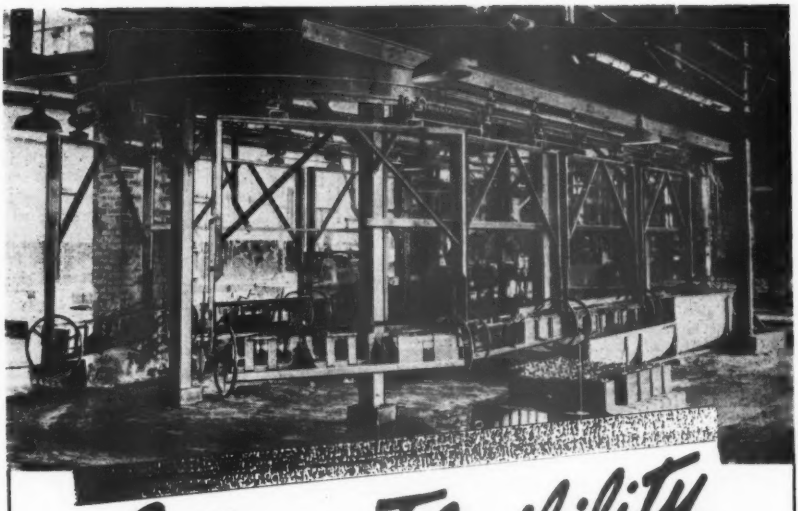
There's a place for one or more Linleys in your shop. Write for instructive bulletin.

◆

VERTICAL JIG BORING, MILLING, DRILLING AND REAMING with 8 speeds and micrometer setting.

SEND FOR DESCRIPTIVE BULLETIN

LINLEY BROTHERS CO.
662 STATE ST. EXTENSION
BRIDGEPORT 1, CONN.



Extreme Flexibility

OFFERS VERSATILE APPLICATIONS

Don't let your handling problems impede your war efforts. The production front is all-important. But even NOW you can keep your eye on the future . . . that post-war period that presents another conversion problem.

American MonoRail Overhead Handling Equipment is extremely flexible. It offers versatile application without costly adjustment or lengthy engineering. Standard parts fit quickly into complete systems.

WRITE FOR Blue Book illustrating hundreds of MonoRail installations

Equip now for Victory . . . prepare now for later changes.

Let our engineers show you results obtained in hundreds of installations.

THE AMERICAN MONORAIL CO.
13131 Athens Ave. Cleveland, Ohio

(Continued from Page 156)

DIAGRAMS AND SPECIFICATIONS of standard steel shapes which can be purchased from the COMMERCIAL SHEARING & STAMPING CO., Dept. J, Youngstown, O., as production items without die or tool charges are detailed in a 20-page bulletin issued by the company. This should be of particular interest to purchasing agents and design engineers **735-E**

THE NO. 12 UNIVERSAL CUTTER AND TOOL GRINDER is designed and constructed to do a large variety of grinding operations for manufacturing and reconditioning of cutting tools, such as milling cutters, reamers, boring bars, etc. Convenience of operation has been the foremost idea of the designers of this machine as they realize if the operator is in a comfortable position he can do more and better work. All controls are in easy reach of the operator and they operate very freely so there is no fatigue in operating the machine. The table and saddle are mounted on ball bearings supported by hardened ground slides and this makes a very free working and accurate slide which is important on this type of grinding machine. Bulletin No. 6-43, describing this machine is available from Covel Mfg. Co., Dept. TAJ-11, Benton Harbor, Mich. Send for your copy. **742-E**

TANTUNG, the trade-name of the new nonferrous cast alloy for metal cutting, is described and illustrated in an attractive 25 page catalog issued by THE VASCO-LOY-RAMET CORP., Dept. J, N. Chicago, Ill. Tantung cuts rolled, forged or cast steel, annealed or heat treated, cast iron, aluminum, brass, copper, bronze or any material that can be machined and can be operated at far greater speeds than are recommended for high-speed steel. No diamond wheels are required in grinding Tantung and some grinding wheel suggestions are given. **25-E**

A HANDBOOK for Distributor Salesmen, giving fundamental information on the manufacture, storage, and usages of Coated Abrasives, including helpful illustrations, has been published by BEHR-MANNING (Div. of Norton Co.) Dept. H, Troy, N. Y. A few of the elementary facts given include what constitutes a quire and a ream of sandpaper, how many yards in a standard roll and how the different grit sizes are produced and compared with one another. **110-E**

(Cont'd on P. 160)

War Plant JUMPS-UP PRODUCTION of TERMINALS from 7500 AN HOUR to 22,000 AN HOUR with the DIEBEL Hi-Speed STAMPING PRESS

Lugs, insulators, condenser plates, washers, brackets, perforated strips and all other small parts can be produced faster and cheaper with the Diebel Hi-Speed Stamping Press. High operating speeds up to 550 a minute. Rock-bottom initial and operating costs. Smallest floor space requirements. Conserves urgently needed man-hours.

Write for catalog

DI MACHINE CORP.
DIVISION OF DIEBEL DIE & MFG. CO.
3653 N. LINCOLN AVE. CHICAGO

Speed... Safety

Men and women... skilled and unskilled, with Lima Gearshift Drives on their machines, are producing vast quantities of vital war materials for our armed forces.

Whether their jobs be running lathes, boring mills, millers, hobbers, shapers, drills, or any of the machine tools producing war materials, production will be higher and safer if their machines are driven with LIMA GEARSHIFT DRIVES.

If you need Fast, Safe, Dependable drive equipment, investigate LIMA GEARSHIFT DRIVES now. Wire or write for address of Lima Engineering Service nearest you.

Large enough to successfully serve you, yet small enough to give personal attention to your needs.

THE LIMA ELECTRIC MOTOR CO.

868 Findlay Road

LIMA, OHIO

REPRESENTATION IN MOST PRINCIPAL CITIES

LIMA GEARSHIFT DRIVES - LIMA ELECTRIC MOTORS
LIMA MAGNETIC POLISHING LATHES - LIMA PEDESTAL GRINDERS

(Continued from Page 158)

A NEW ENGINEERING DATA BOOK covering standard and special tools for Foster 1F, 2F, 3F and 4F Fastermatic turret lathes and instructional information for set-up men and tool engineers is announced by the International Machine Tool Corp., Foster Div., Elkhart, Ind. It is now available to all owners of Fastermatic Automatic Turret Lathes.

This catalog contains descriptions and specifications of all the tools that are made for placing on the Foster Fastermatic turret type automatic turret lathes and the platen type automatic lathes. It contains engineering drawings throughout and illustrates all the basic and fundamental tool dimensions that are necessary for set-up men, master mechanics, time estimators and tool engineers who plan and operate the production of parts. Various dimensions of the tools are easily read in the tables and give the operators the information they need for placing the work on the machine. There are also suggestions, such as how to obtain the greatest production possible in the shortest time, and how to take unusual cuts of doubling up operations in the most efficient manner of handling both large and small production work.

Each tool is described with all pertinent information and the various types of operations it will perform. This is illustrated by line drawings to show how the tool mounts on the machine and an example of one particular type of operation it is capable of performing. **337-E**

SHIPPED AT PEACE-TIME SPEED

GILBARCO COOLANT PUMPS are made by one of the country's largest pump manufacturers for all machine operations. Rugged and durable, they are built for 24 hours a day service.

STANDARD MOTORS Pumps with motors for all regular voltages and cycles, two or three phase, shipped promptly.

SPECIAL MOTORS Facilities for winding motors for unusual electrical characteristics enable us to ship almost as promptly as standard units.

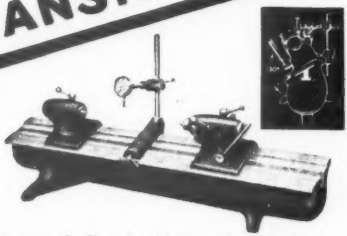
Write or wire for literature and prices

GILBERT & BARKER MFG. CO.
WEST SPRINGFIELD, MASS.

HOW TO GET better finishes on ground surfaces is explained and illustrated in a pocket-size manual issued by POPE MACHINERY CORP., 267 River St., Haverhill, Mass. The Pope Balancing Wheel Holder and Balancing Stand and Arbor are shown. This booklet deals specifically with the balancing of grinding wheels for 6" x 18" Surface Grinders and the like; how to do it, and the resulting benefits. **741-E**

A DESCRIPTION of various types of springs and how to order them is discussed and illustrated in a 43-page booklet issued by THE WILLIAM D. GIBSON CO., 1800 Clybourn Ave., Chicago, Ill. They have endeavored to show the usual method of drawing springs so that draughtsmen, engineers or users of springs can, by referring to this catalogue, send sketches or drawings which will give them all the sizes of the springs they require. All springs manufactured by this company are made to order only. **740-E**

GOOD TOOLS PROMOTE GOOD WORKMANSHIP

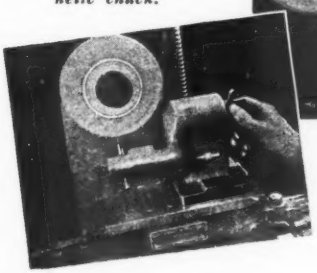


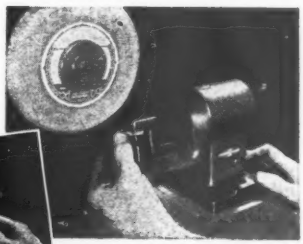
AMERICAN BENCH CENTERS will help you do better work. Improved design. Box section bed. Three point support. Always solid on bench. Inclined face. More room for operator's hands. Can't become "catch all" for tools. Both heads adjustable. Retracting lever permits removal of work without changing adjustments. Three sizes: 8"x36"; 6"x24"; 4"x10". Available also with riser blocks for checking work of larger diameters.

Improved Bench Center for testing and checking parts between centers.

AMERICAN RADIUS DRESSER is sturdy, compact, precision-built. Sets up quickly. Clears 7½" wheel and dresses convex or concave radii up to 1 inch. Swivel arm pivots on hardened and ground steel shaft; large thrust surfaces, dustproof bearings; constant lubrication.

Base of radius dresser is machined parallel to center line of swivel arm to set against straight edge of magnetic chuck.





Easily set to gage block accuracy. Z-block is clamped to swivel arm and removed after diamond has been set to correct radius.

Send for Bulletin No. 43-TDJ giving complete details on American Tools and Gages, precision built since 1919.

THE AMERICAN GAUGE CO.
125 Bayard Street DAYTON, OHIO

New Industrial Fluid Cooler

THE Gray-Mills Co. recently announced a new, wide-purpose, industrial fluid refrigerating system which has proved particularly timely. This new Model 400 mechanically refrigerates fluid, settles and screens out chips and the coarser abrasives and applies the coolant or fluid to the work through the medium of a self-contained pump.

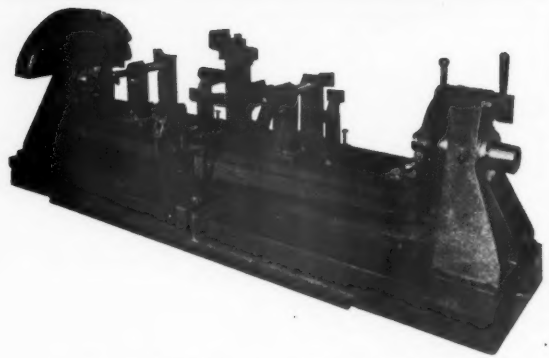
With special emphasis on coolants for metal cutting, hydraulic oil applications, maintenance of submerged bearing temperatures, quenching oils, spot welders and laboratory set-ups, the Model 400 is adaptable to the cooling and temperature maintenance of many industrial fluids.

The Model 400 is compact, occupying only 28½" x 33" floor space and standing 44" high, is serviceable either as a temporary or a permanent integral part of existing equipment because it is completely portable and ready to go to work by simply plugging in to the power line.

The unit is equipped with a 1 hp compressor rated at 11,800 B.T.U.'s. Centrifugal or gear-type coolant pumps are optional as required. The centrifugal has a rated capacity of 3000 G.P.H. (water at no head) at 7 lbs. pressure and the gear pump is rated at 180 G.P.H. at 50 lbs. pressure. The cooling tank with a capacity of 35 gallons is equipped with removable 45° settling and filtering screens.

Write Gray-Mills Co., 211 W. Ontario St., Chicago, Ill., for information. 555-E.

We Sell Precision . .



★ Dies, Jigs, Fixtures, Special Machinery and Designing.

Hardened and Ground Parts to Order.

MASTER MACHINE & TOOL COMPANY

925 WEST NORTH AVENUE, CHICAGO, ILL.

"PUT IT ON THE BLANCHARD"

GRINDING BALL BEARING RACES ON THE BLANCHARD NO. 18 SURFACE GRINDER

CHECK THESE ADVANTAGES OF BLANCHARD GRINDING

- ★ Production
- Adaptability
- Fixture Saving
- Operation Saving
- Material Saving
- Fine Finish
- Flatness
- ★ Close Limits

★ . . . . . *Especially valuable on jobs like the one illustrated.*

Steel ball bearing races are ground on the sides on the Blanchard surface grinder, producing parallel surfaces from which other operations are located.

A Blanchard demagnetizer and washing attachment are used to demagnetize and clean the work.

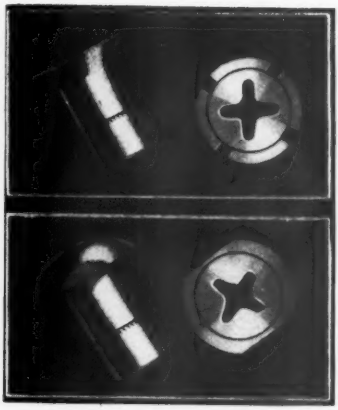
.008 inches of stock are removed from each side of 3⅜" ball bearing races to limits of ±.001" and .0003" for parallelism.

Blanchard Grinding produces accurate parallel sides — and produces them at a rate of 250 rings (500 surfaces) per hour.

The BLANCHARD MACHINE COMPANY
64 STATE STREET, CAMBRIDGE, MASS.

BLANCHARD

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.



New Blind Rivet Developed

THE Pacific Railway Equipment Co. of Los Angeles, Calif., has just announced the development of a new blind rivet that has the simplicity and reliability of a common screw and nut.

The new Preco rivet is applicable in almost any place where riveting is used and is particularly adaptable for blind riveting. The Preco rivet is ready at all times for immediate installation and requires no special care as to storage, handling and use.

Use of the rivet requires no special operations and no drilling or reaming, eliminating delays, irons to heat, mandrels to trim, etc. It can be installed by one operator, experienced or inexperienced, with no special training.

The Preco rivet is the result of a combination of a steel cadmium-plated recessed head screw, either Phillips or Reed and Prince, inserted into the hollow stem of a high strength aluminum alloy rivet, and a knurled nut of Dural threaded on the end of the screw. Both rivet sleeve and nut are anodized.

Two styles of Preco rivets are available—the "Raised" Head type as illustrated and the "Flush" Head type. Each comes in three diameters—1/8", 5/32" and 3/16" with grip lengths covering the normal range. All are color coded to denote grip length of rivet.

The Pacific Railway Equipment Co., 968 E. 61 St., Los Angeles, Calif., will send complete details on request. 743-E.

DOUGLAS PRECISION SLOTTER
Swiveling ram head and tool holder, automatic circular table and independent automatic feeds in all directions.
7" TO 10" STROKE
DOUGLAS
PROMPT DELIVERY
DOUGLAS MACHINERY CO. INC.
150 BROADWAY
NEW YORK, N. Y.

Tannewitz DI-SAWS

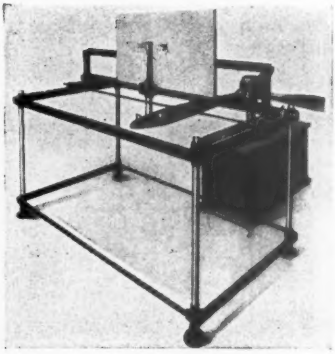
have LARGER CAPACITY, saw *Easier*, STRAIGHTER

In making inside and outside cuts on dies, tools, jigs, etc., as well as inside and outside filing and polishing, the modern die saw will save upwards of 70 per cent of the time required by ordinary methods and reduce costs proportionately. Don't overlook this great opportunity to step up both production and profits. But be sure to get the machine that gives you the added advantage of EXTRA CAPACITY (a full 24 inches between the blades) and the easier and straighter cutting that naturally follows from the use of larger wheels. Get the complete facts concerning the TANNEWITZ M-24, the most highly developed die saw on the market. Simply write for our DI-SAW Bulletin. Also describes larger DI-SAWS for special applications.

Other bulletins on request: Single and Variable Speed Foundry Band Saws; SHEET METAL CUTTING Band Saws.

THE TANNEWITZ WORKS, GRAND RAPIDS, MICHIGAN

New Device for Duplicating Contours



A RECENT addition to the market was made by Inter-Lakes Engineering Co., Detroit, Mich., when they introduced a device which makes it possible to ascertain the exact contour of irregular surfaces in a fraction of the time required by the former method of cutting and fitting wood templates.

The "Dupligraph", as this instrument is called, transfers on transparent paper the exact contour of the irregular object such as the propeller blade here illustrated. It will also transcribe the contour directly on metal.

Securing concave readings in forming dies which frequently cannot be checked with ordinary templates is another advantage offered by the use of the Dupligraph. It also solves the problem of securing a true reading of a stamping, showing the amount of spring-back and warp.

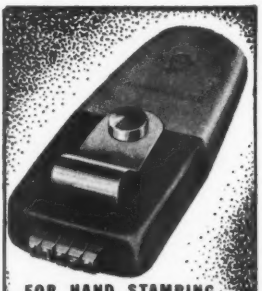
The Dupligraph replaces an inspector's time in the manufacture of products which require the close following of models, as it gives cross-section lines relative to each other. This is usually done on vellum and checked against the draft or layout. This results in a full contour line as compared with only a spot dimensional check by the former method.

Write Inter-Lakes Engineering Co., 510 Transportation Bldg., Detroit 26, Mich., for descriptive literature. 744-E.

STAMPING
MULTIPLE CHARACTERS

with Matthews
***Champion* HOLDER**

Made for hand stamping or press use... Matthews 'Champion' Holder can be used for 90% of all heavy or medium duty marking applications. Type changing is amazingly fast... marking is clean cut and in alignment. Write for Catalog 146-A for full particulars.



FOR HAND STAMPING

FOR PRESS STAMPING

FOR STAMPING ROUNDS

JAS. H. MATTHEWS & CO.

3896 Forbes Street Pittsburgh, Pa.
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New York, Boston, Chicago, Philadelphia, Newark, Syracuse
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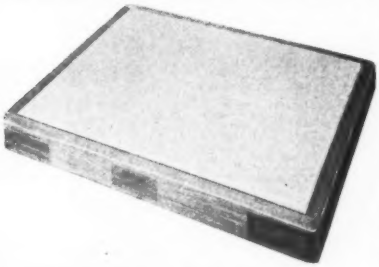
THE NEW TRUPLANE STRUCTURAL GLASS

Surface Plate



1. REMAINS FLAT INDEFINITELY!

2. OUTWEARS CAST IRON OR STEEL!

SAVE TIME AND MONEY waiting for delivery of metal plates or resurfacing of your old plates by using this accurate, low cost structural glass plate. Precision lapped to over-all flatness of less than .0002". Does not warp or twist. Low co-efficient of expansion leaves it unaffected by temperature changes, guaranteeing you greater accuracy. Non-magnetic and non-corrosive. Hard surface can be scratched but scratches raise no burr and do not affect accuracy of plate. Instruments do not stick to surface. Truplane plates are lighter and easier to handle than cast iron. Mounted in hardwood case with cover to protect surface and edges.

PROMPT DELIVERY

Stock sizes for immediate delivery include 14"x18", $49.00; 16"x20", $58.25; 20"x24", $87.50, F.O.B. Cleveland. Two weeks delivery on sizes not in stock. Send coupon for full story.

We can fill your requirements for Die Springs, Dowel Pins, Socket Screws and all other Die Maker's supplies.

Don't be "stumped" if the specifications call for

DRILLING HARDENED STEEL

● You can do it! HARDSTEEL Drills enable you to drill, counterbore or enlarge holes in hardened steel by the same methods you would use on soft steel, and *without annealing any portion of the piece.* A remarkable time saver! Write for more information.

SEND COUPON TODAY

DIE SUPPLY CO.
4751 HOUGH AVE., CLEVELAND, OHIO

☐ Send full story on Truplane plates.
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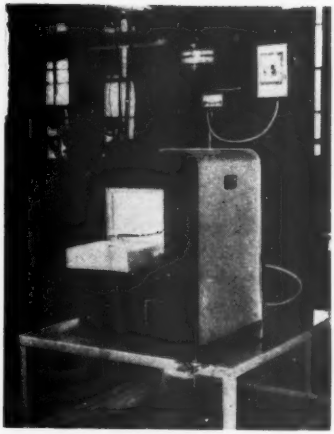
DIE SUPPLY CO.

4751 Hough Ave. Cleveland, Ohio



Muffle Furnace for Heat Treating Small Parts

TO offset the excessive demands placed upon commercial heat treating plants, the Cooley Electric Manufacturing Co. has developed a new small electric muffle furnace. These are used for fast and economical heat-treating of small parts, drawing or annealing small parts, pre-heating for subsequent high speed hardening and for emergency repair orders where one or two small installations can be used profitably as auxiliary equipment to larger furnaces.

These furnaces are available in two sizes—Types MH-3 and MH-4. Both can be easily installed, usually mounted on a sheet metal table.

They are simple in structure, the outer shell being of heavy gauge sheet metal interposed between cast iron end frames secured by through rods. The elements consist of rectangular refractory blocks in which nickel-chromium resistors are embedded. Unusual uniformity of chamber temperature is secured by rapid heat diffusion and power concentration at heat loss points.

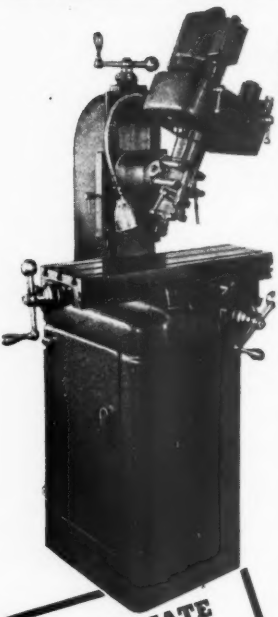
Type MH-3 has a chamber capacity 8" wide, 6" high by 14" deep and measures 18" x 22" x 23" outside; maximum power consumption, 3400 watts. Type MH-4 has a chamber capacity 10" wide by 6" high by 18" deep and measures 18" x 22" x 27"; maximum power consumption, 4800 watts.

Write Cooley Electric Mfg. Corp., 215 S. Senate Ave., Indianapolis, Indiana. 587-E.

HOLLAND MILLER

With

SWIVEL HEAD



This rigid and versatile miller answers the need for a flexible toolroom and production machine with an unusually wide range of speeds. Note these exclusive features:

- Controls of table and head are all reached conveniently from the operator's seat.
- Rigid table mounting at permanent height provides extra stability and accuracy.
- Swivel Head, with motor centered above spindle, has 8" travel and 3" quill feed.
- A wide range of speeds, 200-4375 RPM, with standard motor, or 1/3 less with slow speed motor, is offered for boring and high-speed milling.

Write TODAY for complete specifications and descriptive details.

IMMEDIATE DELIVERY

J. W. HOLLAND CO.

Box 107

Fitchburg ● Mass.

☆ ☆ ☆ ☆ ☆ ☆ ☆

Tolerance ±.0001"

with the

MOORE

JIG BORER

The deadly accuracy of our most powerful weapons starts with accuracy in the machining of their smallest parts. Eleven Moore Jig Borers operated by women at the Arma Corporation speed the production of high-precision instruments for the United States Navy.

☆ ☆ ☆ ☆ For the complex equipment of war—and the amazing age of mass production to follow—tolerances thought impossible to attain a few years ago are today routine requirements. The Moore Precision Jig Borer answers the increasing demands for greater accuracy and speed in boring holes for jigs, fixtures, dies, gauges and special machine parts—and yet is so simple to operate that women quickly become proficient at it. ℂ Moore-produced micrometer screws, ground to an accuracy never achieved before, give the Coordinate Location Method—an outstanding feature of the Moore Jig Borer—definite advantages over the graduated scale and size block methods of measurement. Inaccuracies between any two points, with the long screw, will not exceed .0002" and with the short screw .0001". The Moore Jig Borer is guaranteed to space and bore holes accurately within limits of .00025" in any position of the table. ℂ The range, sensitivity and rigidity of the spindle are evidenced in its ability to drill holes of 1/32" or less and yet to take a ¼" cut accurately in increasing a hole from 2" to 2½" in one cut under power feed.

PARTNERS IN PRODUCTION—The Moore Jig Borer and the Moore Jig Grinder, each outstanding in its own specialty, together form a modern toolroom partnership to save production time and increase die life. The Jig Grinder finish-grinds holes to size and location on both hard and soft work within .0001". Write today for descriptive literature on how these two machines will modernize your toolroom production.

MOORE SPECIAL TOOL COMPANY INC.

740 UNION AVENUE, BRIDGEPORT 7, CONN.

SHOP AIDS

In requesting copies of books, please address your request directly to the designated publisher.

METALWORK TECHNOLOGY AND PRACTICE—by Oswald A. Ludwig furnishes elementary information in metalwork. It describes the tools, materials and operations common to metalworking occupations such as automotive and aeronautical work, metal patternmaking, foundry work, sheet metal trades and all industrial manufacturing. This manual fills the need of shop theory, technology and "shop science" classes. Simple language and abundant illustrations make the book easily understood. A few of the chapter headings include: Planning the Job; Care of Equipment; Drill Press Work; Threads, Dies, Taps; Heating Metal; Tool Sharpening; Finishing and Inspection; Machine Tools. McKnight & McKnight, Bloomington, Ill., offer the book at $4.00.

KNOW-HOW HANDBOOK—deals with improved production, maintenance and conservation practices that will insure the most effective use of the common types of tools, machines and equipment. It is a fact book and a handy guide to shop problems. Each section contains elementary data covering the more commonly used types of equipment and processes in that field. These data sheets are particularly valuable for employee training. The book has a great many helpful drawings and is subdivided into such sections as: Electrical Information, Mechanical Power Transmission, Materials Handling, Plant Maintenance, Metal Working. At only 40c the copy, the book is available from War Production Drive Headquarters, WPB, Washington, D. C.

SHOP MATHEMATICS—by Arthur A. Dick has the material arranged in a definite sequential order into teaching units and assignments. Numerous figures, diagrams and working drawings make the instruction material very effective in practice. Algebraic forms of simple equations are presented, as they serve as the basis for the solution of all formulas. A number of practical text applications are provided. The book is divided into the following distinctive groups: Geometrical Computations; Mechanical Applications; Practical Trigonometry Distributed by Ronald Press Co., 15 E. 26th St., New York, N. Y. Price, $2.40.

INDUSTRIAL PRODUCTION ILLUSTRATION—In this text the authors, Randolph P. Hoelscher, Clifford H. Springer and Richard F. Pohle, have presented not only perspective, but the entire range of pictorial drawing. Their aim was twofold: The first has been to make a thorough and comprehensive treatment of pictorial drawing from the standpoint of theory.

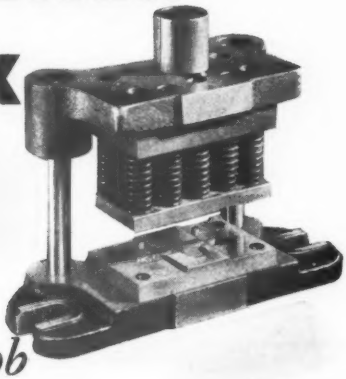
In this respect, attention is called to the exact method of making axonometric projections as presented in Chapter V. This presents a new synthesis in the theory of orthographic projection.

The second aim has been that of practical usefulness. The text has been prepared especially to meet the immediate need in the aircraft, ordnance and shipbuilding fields. An adequate amount of carefully graded problem material has been included. Many of the problems are on tear-out sheets upon which the preliminary layout has been done, permitting the student to concentrate on pictorial drawing.

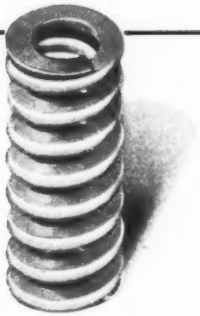
Priced at $3.50 by McGraw-Hill Book Company, 330 W. 42nd St., New York, N. Y.

(Continued on Page 172)

FASTER, FINER DIE WORK



By using the Die Spring Tailored for the Job



WARTIME die work demands greater speed and accuracy. You can meet this demand by using the die spring tailored to the job... and to the press. Customized die springs for each particular requirement are available at Muehlhausen; in series "S" for high speed, "M" for regular speed, and "HD" for heavy duty presses. Over 200 sizes are stocked, ranging from 1 to 15 inches in length, from ¾ to 4 inches in diameter, and from 80 to 3000 lbs. in load capacity.

MUEHLHAUSEN SPRING CORPORATION
Division of Standard Steel Spring Company
875 Michigan Avenue, Logansport, Indiana

WRITE FOR *FREE* DIE FOLDER!

Illustrates and describes die springs in 206 sizes and types.

Muehlhausen Spring Corporation
875 Michigan Avenue,
Logansport, Indiana
Send Die Spring Booklet, Free.
Name_____
Address_____
City_____ State_____

MUEHLHAUSEN SPRINGS
EVERY TYPE AND SIZE

(Continued from Page 170)

ADDITION AND SUBTRACTION LOGARITHMS TO SEVEN DECIMAL PLACES—edited by William W. Johnson simplifies the work required to evaluate formulas which require addition and subtraction and which are not adapted to logarithmic computation. The book contains 126 tables with a full page devoted to each. Available from Charles T. Powner Co., P. O. Box 796, Chicago, Ill. Price, $2.00.

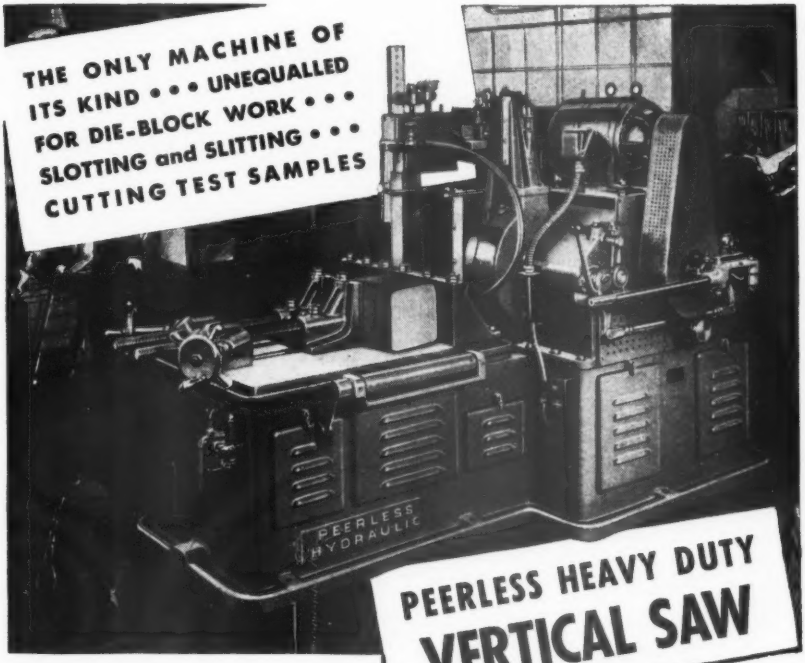
METAL SPINNING—by James E. Reagan and Earl E. Smith presents the work in a simple step-by-step manner to meet the needs of students who have had little or no experience in this subject, and can well be of assistance to the craftsman. The book contains specific information as to the mechanical setup for metal spinning, using ordinary lathes found in homes and schools; spinning tools; chucks; treatment of different metals; technique of metal spinning; and projects. All chapters are complete with photographs and detailed cross sectional drawings. The chapter on Projects contains diagrams on how to make such articles as trays, nut bowls, candlesticks, lamps, vases, etc. Since the book is based on actual results obtained in a school metal shop where the authors are shop instructors, it will be valuable for use in industrial art courses in training schools where it is desirable to establish practical branches of metal working. The Bruce Publishing Co., 540 N. Milwuakee St., Milwaukee 1, Wis. Price $1.25.

TUNGSTEN—By K. C. Li and C. Y. Wang is a comprehensive study of the history and development of tungsten. In the "Foreword" Author Li tells of his explorations in the mountainous regions of southwestern China for wolframite, the most important tungsten bearing material, in a successful endeavor to offset the tungsten near-monopoly being attained by the Germans and the Japanese. Chapters include: the Geology of Tungsten, Ore Dressing of Tungsten, Metallurgy of Tungsten, Chemistry of Tungsten, Analysis of Tungsten, Industrial Application of Tungsten and the Substitution of Tungsten. The book is well illustrated with natural color photographs, maps, drawings, tables and charts. "Tungsten" is available from Reinhold Publishing Corp., 330 W. 42nd St., New York, N. Y. Price, $7.00.

AMES
UPRIGHT GAUGE No. 13
The model best suited for general testing and measuring in thousandths inches or less. Base is 8 inches square. Capacity for measuring to 6 inches. Weight 17 pounds.
Price
$30.00
B. C. AMES CO. Waltham, Mass.

PAINT SPRAYING RULES—A wall chart of paint spraying rules showing how to save paint, air, time, power, fuel and equipment, reduce time lost because of sickness or accident, and improve results, has been published by the Eclipse Air Brush Co., 402 Park Ave., Newark 7, N. J. These rules apply to all types of spray equipment, not necessarily to that made by Eclipse. This chart will be sent free to anyone requesting it. **736-E**

(Cont'd on P. 174)


THE ONLY MACHINE OF ITS KIND • • • UNEQUALLED FOR DIE-BLOCK WORK • • • SLOTTING and SLITTING • • • CUTTING TEST SAMPLES
PEERLESS HYDRAULIC

PEERLESS HEAVY DUTY VERTICAL SAW

THE PEERLESS Heavy Duty Vertical Saw is the only hydraulically controlled power saw available for cutting out slabs of tool stock as long as 24" and any thickness up to 10". Capacity with standard vise is 16" x 16".

For reshaping worn blocks . . . for slotting and slitting operations in odd shaped structures . . . the performance of the Peerless Heavy Duty Vertical is excelled by no other machine.

None of the precious metal is wasted when stock is cut by this Peerless, which makes the first and only cut to tolerances of thousandths. Feed, lift on the non-cutting stroke, and the rapid blade return are closely controlled and operated hydraulically. A convenient chip tray makes it easy to salvage every bit of precious "steel dust."

Get complete information — use the convenient coupon.

PEERLESS MACHINE COMPANY, 1600 Junction Ave., Racine, Wis.

Peerless

THE ONLY METAL CUTTING SAW WITH FOUR-SIDED SAW-FRAME AND BACKING-PLATE

Peerless Machine Co., TD-1143, Racine, Wis.
( ) Mail catalog on Peerless Standard Power Saws
( ) Mail catalog on complete Peerless line of Hydraulic, Vertical and Universal Saws

Company .....
Individual .....
Street .....
City ..... State .....

Your ACCURATE Sawing DEMANDS PEERLESS SAW CONTROL

(Continued from Page 172)

SELECTED THREAD SYSTEMS, FORMS AND MEASUREMENTS—In selecting the material for this folder, the aim has been to provide—in convenient, compact form—reference data on standard thread systems most commonly met with in the operation of thread grinding machines. Care has been taken to list as basic all the theoretical or nominal standard sizes from which, for machining and fitting purposes, the tolerances are allowed. Many of the interesting subjects covered include: Definitions of Terms Relating to Screw Threads; Terms Relating to Classification and Tolerances; Marking Symbols; Measuring Screw Threads by the Three Wire Method; American National Form of Thread; American National Acme Threads, International Metric Thread System and Speeds of Grinding Wheels. Drawings, Work Speed Charts, Conversion Tables (Millimeters to Decimal inches); Tables of Thread Elements; Hardness Conversion Tables; and Tables for Measuring Various Pitches and Thread Forms are among the many valuable aids included in the book, which is available from Ex-Cell-O Corp., 1208 Oakman Blvd., Detroit, Mich. **737-E**

SHOP NOTES ON THE MACHINING OF STAINLESS STEEL—outlines machining methods that have been developed and proven in production. The booklet discusses in detail stainless steel types, cutting rates, turning operations on an automatic and turret lathe, cut-off tools, forming tool methods, shave tool applications, drilling, reaming and tapping. Many free-hand drawings further simplify the contents of the booklet, which is available from Rustless Iron and Steel Corp., Dept. J, Baltimore, Md. **738-E**

Industrial
DIAMOND TOOLS
The STA-KOOL Single-Point Tool is equipped with internal coolant ducts and external cooling fins to quickly dissipate the heat, thus prolonging tool life.
SMITITE Diamond Dressing Tools employ a sintered metal setting, which firmly holds the stones till they are completely consumed.
Catalogs on request
J. K. SMIT & SONS
157 Chambers St., New York, N. Y. 6400 Tireman Ave., Detroit, Mich.

HOW TO MAINTAIN ELECTRIC EQUIPMENT IN INDUSTRY—Here in one volume are tips on how to keep GE equipment in top-notch condition. More than 500 illustrations, dozens of new tables, many hitherto unpublished charts and easy-to-use indexing combine to make this comprehensive book valuable. Preventive maintenance schedules and trouble-shooting charts are included on nearly all types of apparatus. Photographs and diagrams give suggestions on what to do to get maximum performance and longer life out of your equipment; show what constitutes good maintenance procedure and warn of troubles that may arise from improper care. Special emphasis has been placed on maintenance practices which will help you prevent electrical troubles through scheduled inspection and care. Prominent marginal headings make it easy to find the material you are looking for and plenty of space has been provided

(Cont'd on P. 176)

SENSITIVE

TAPPING MACHINES

give better results

Special design, improved dry-clutch and precision workmanship make Procunier Tapping Machines *so sensitive* that even unskilled operators can detect an overloaded or dull tap—or determine instantly when tap hits bottom of hole. That means greatly decreased tap breakage. Other features of Procunier design that assure faster, more accurate tapping are: The extra-long spiral compensating springs, with wide range of hand screw adjustments, maintain pre-set tap feeding and reversing pressure INDEPENDENT OF THE OPERATOR; Four speeds, ranging from 390 to 2050 RPM efficiently handle jobs for which conventional high speed tapping machines are inadequate; One machine handles tap sizes from No. 2 to ½" through two interchangeable heads.

Tap Establishes Its Own Lead

The new Procunier Universal Tapping Machine is exclusively designed so that it actually allows the tap to establish its own lead. There is nothing more accurate than a precision ground thread tap as a guide for tapping—so maximum tapping efficiency is attained where an accurate tap is free to establish its own lead in cutting the thread.

SEND FOR SPECIAL BULLETIN giving full details and prices on the full line of Procunier Universal Tapping Machines, Procunier Precision Tapping Heads and the new Tru-Grip Tap Holder.

PROCUNIER
For Faster, More Accurate Tapping

PROCUNIER SAFETY CHUCK COMPANY
12-14 S. Clinton St., Chicago, Ill.

Send me bulletins on: ☐ High Speed Tapping Heads ☐ Tru-Grip Tap Holders ☐ Universal Tapping Machines

Name.....

Address.....

City.....State.....

MAIL THIS COUPON TODAY!

(Continued from Page 174)

for making notes. The book is available for $1.75 from General Electric Co., Schenectady, New York. **77-E**

OF PARTICULAR INTEREST to users of Federal Model 1201 Series Centralizing Hole Gages is a new instruction booklet issued by Federal Products Corp., 1144 Eddy St., Providence, R. I., and available to those Gages is a new instruction booklet prepared who have purchased the gage. The booklet goes into such details as how to handle and read the hole gage, how to set the gage and miscellaneous details, all relating to the handling and application of a highly sensitive and accurate dial indicator type of gage. **4-E**

COMPILED AS A SPECIAL SERVICE TO WAR INDUSTRIES and having the commendation of the War Production Board, a power transmission system maintenance book is announced by the Cling Surface Co., 1048 Niagara St., Buffalo, N. Y., manufacturer of leather belt dressing and preservatives.

Section 1 deals with the planning of drives; the advantages of modern group drive and comparative costs.

Sections 2 and 3 constitute 16 pages outlining a comprehensive maintenance, repair and salvage procedure for such power transmission components as motors, stringers, hangers and bearings, shafting, pulleys and belting.

Section 4 details the benefits that accrue from following the recommended program.

SLIDE RULE SIMPLIFIED—by Charles O. Harris, Assistant Professor of Mechanics, Illinois Institute of Technology.

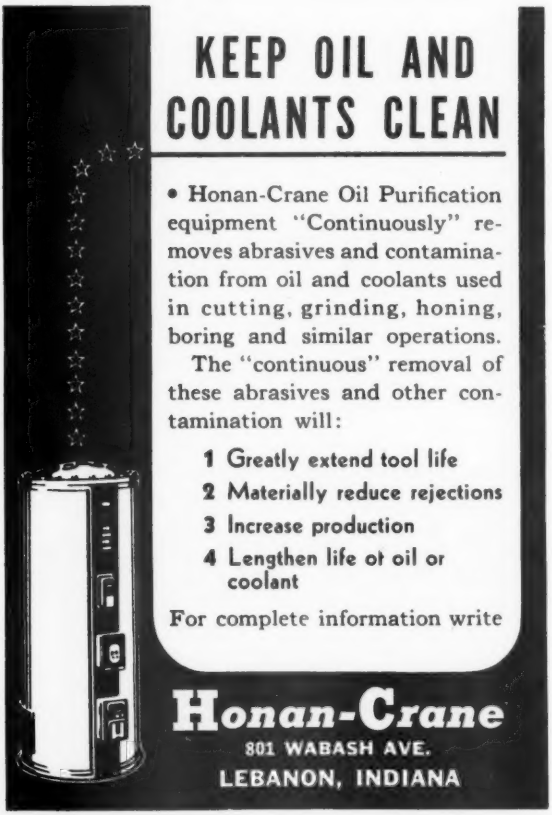
This book will be found helpful to people who want to use the slide rule only for common type calculations and for those who want to use it for all types including advanced mathematics.

Readers who have had no mathematics beyond the eighth grade will be able to learn from this practical book as it will show them how to do the common type calculations such as multiplication, division, square and square root, cube and cube root, etc., and combinations of these operations; the first eight chapters being devoted to these elementary calculations.

Those who want to master the slide rule for advanced calculations should study the first eight chapters for refresher or review work, and then from chapter nine on they will more readily learn how to employ it for the advanced work.

Because the features of the various types of slide rules differ to the extent of being puzzling, the author has drawn comparisons and explained the differences between the several rules.

(Cont'd on P. 178)


KEEP OIL AND COOLANTS CLEAN
• Honan-Crane Oil Purification equipment "Continuously" removes abrasives and contamination from oil and coolants used in cutting, grinding, honing, boring and similar operations.
The "continuous" removal of these abrasives and other contamination will:
1 Greatly extend tool life
2 Materially reduce rejections
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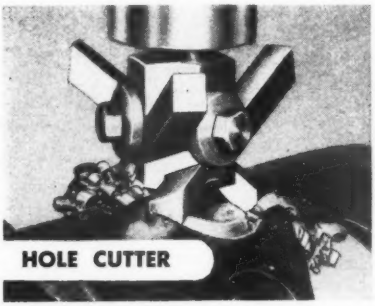
HOW TO REPLACE CUTTING TOOLS
that can't be salvaged!

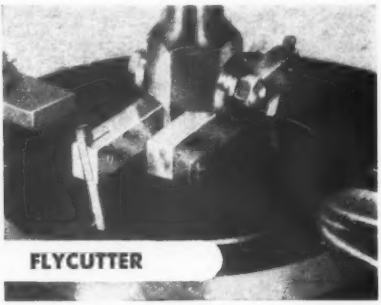
When worn or broken cutting tools can't be reclaimed for further service, replacement should be made with tools that conserve vital materials, time and labor. CLARK CUTTING TOOLS comply with these critical requirements, do better work quicker.

They use a minimum of tool steel, in cutting blades only; these can be resharpened repeatedly, replaced economically. Being adjustable, a few sizes do the work of many other tools, slash inventory. They make clean, *finished* cuts, reduce operations.



EXAMPLE NO. 1

Clark Adjustable 3-Blade Hole Cutters make accurate, smooth holes in flat or curved metal, plastics, wood, transite. 7 sizes cut ⅝" to 5", up to 1" thick. No reaming, deburring. Fewer operations are required.



EXAMPLE NO. 2

Clark Adjustable 2-Blade Flycutters. 2 sizes cut holes or discs 2½" to 10", up to 1" thick. Pitched blades cut true, relieve chatter. Other models cut gaskets, rings, discs from live rubber, problem materials.

WRITE FOR BULLETIN NO. TD-11

In Canada: DOMINION BEARINGS, LTD., TORONTO, MONTREAL, WINNIPEG
Export: THE AMERICAN STEEL EXPORT COMPANY, INC., NEW YORK, LOS ANGELES

Robert H. Clark Company

3424 SUNSET BLVD., LOS ANGELES 26 • MANUFACTURERS: PRECISION TOOLS, PRECISION PARTS

(Continued from Page 176)

"Slide Rule Simplified" contains 266 pages, is well illustrated and is cloth bound. The book and a Dietzgen Slide Rule are priced at $3.50. Price of book only: $2.50. Publisher: American Technical Society, Drexel Ave. at 58th St., Chicago.

NEW TOWMOTOR 14" x 22" SAFETY SIGNS—for factory lift truck routes offer quick, easily read warnings to both lift truck operators and pedestrian employees, thus helping to insure safety, prevent lost-time accidents and consequent production lags. Bold letters carry the warnings: "Caution: Low Head Room," "Slow: Narrow Aisle Ahead"; "Slow: Blind Corner," and "Stop: Crossing."

Safety directors are invited to submit requests for these posters to Towmotor Corp., 1226 E. 152nd St., Cleveland 10, Ohio, specifying the quantity desired. **495-E**

OHM'S LAW CALCULATOR SAVES TIME—The Ohm's Law Calculator, by showing the relationship between ohms, volts, current and watts, is a definite aid in the training of technical men.

The calculator is a handy size (4⅛"x9"), and makes it easy for anyone to obtain the answers to Ohm's Law problems with only one setting of the slide. There is no fumbling over decimal points as all values are direct reading over the entire range which covers both the low current, high resistance radio and electronic problems and the higher current, lower resistance cases involving motors, generators, and power circuits.

There are scales on both faces, the side illustrated covering resistances from .1 ohm to 1,000 ohms and the other side extending the range up to 10 megohms (10,000,000 ohms). Currents in the commercial range are given in amperes, and in the radio-electronic range in milliamperes.

It is not necessary to know Ohm's Law or to put your resistance calculation in the form of an equation in order to use the calculator yet it is equally useful to the trained engineer and to the student. All you need to know are any two values for the circuit in question such as the ohms and watts, ohms and current, ohms and volts, volts and amperes, volts and watts or amperes and watts. The slide is set by means of the known values and both of the remaining factors are then read from scales at the one setting. Brief instructions and examples are printed on both sides of the calculator.

Many problems in multiplication, division, square roots, and squares also can be solved on the calculator thus providing the added convenience of a slide rule.

The Ohmite Ohm's Law Calculator can be obtained for 10c (in coin) from Ohmite Mfg. Co., 4835 Flournay St., Chicago 44, Ill. **739-E**

(Cont'd on P. 180)

A Better Positioner for every welding job

No matter what type welding you do there's a C-F Positioner exactly suited to your requirements. Ranging from small hand operated models like the one above to the giant, push button controlled, monster shown below, C-F Positioners revolve weldments a full 360 degrees, tilt them to 135 degrees beyond horizontal—permit down-hand welding of all sides with a single set-up. All are universal tools; *are adjustable for height*, handle a wide range of work and are pedestal or boom mounted to give maximum floor and working clearance.

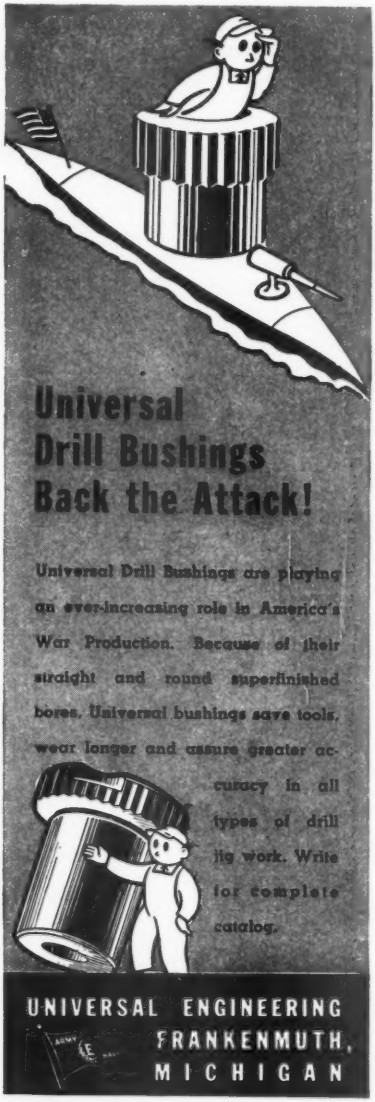
Write for Bulletin WP 22

Top: Model No. 12. 1,200 lb. capacity, manually operated.

Bottom: Model No. 300. 30,000 lb. capacity, push button control.

CULLEN - FRIESTEDT COMPANY
1316 S. Kilbourn Ave. Chicago 23, U. S. A.

Kennametal Inc., Latrobe, Pa., has opened a Philadelphia office and warehouse for the sale, tool engineering and service of their products in Eastern Pennsylvania, Southern New Jersey, Maryland, the District of Columbia, Virginia and other specific areas.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Back the Attack!
Universal Drill Bushings are playing an ever-increasing role in America's War Production. Because of their straight and round superfinished bores, Universal bushings save tools, wear longer and assure greater accuracy in all types of drill jig work. Write for complete catalog.
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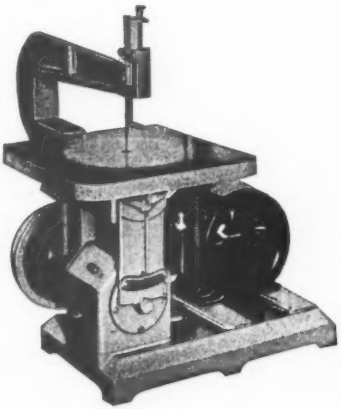

ATLAS DIE FILING MACHINES

Can be used for all kinds of die making. The overarm is constructed so that the file and saw attachments may be interchanged with little effort. The hold-down fingers are attached directly to the overarm. Working surface of the table, which tilts two directions, is entirely clear. An improved type of chuck, consisting of movable hardened jaws, holds both saws and files. Screw adjustment makes changes easy and fast.

COMPLETE WITH MOTOR—$125 NET
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ATLAS EQUIPMENT COMPANY
101 S. CLINTON ST., CHICAGO, ILL.

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(Continued from Page 178)

ANALYSIS OF MACHINE SHOP OPERATIONS is a manual for training apprentice and learners written by Donald F. Lane, Training Specialist and Training Consultant for Training Within Industry Branch of the War Manpower Commission and published by the National Foremen's Institute, Inc., Deep River, Conn. This manual has been prepared especially for those who are undertaking training programs of one kind or another. Its primary objective is to assist industry in securing the gradations of skilled labor that are essential in meeting the ever-increasing demands of war production. Nineteen sets of data sheets have been worked up, one set for each of the common machine tools and processes. Included with each set is a graphic analysis of the human characteristics required in operating that particular machine or performing that particular process.

A SPEED CALCULATOR—just developed is available for fifteen cents from the Eastern Machine Screw Corp., Truman & Barclay Sts., New Haven 6, Conn. Correct turning speeds are found by referring to a surface speed table covering many different steels, including the new NE steels, heat treated and non-heat treated. Then one setting of the dial calculator will give the proper spindle speed in revolutions per minute for a large range of stock diameters expressed in fractional and decimal inches and millimeters. Proper thread cutting speeds are readily determined by following the same procedure. The number of surface feet for a given rpm may also be found by one setting of the dial and read against the full range of stock diameters. Another feature of the calculator is the giving of the gross production per hour when the time for making one piece is known. **210-E**

IMPROVED GRINDING ATTACHMENTS — Liberty Tool & Gage Works, Inc., of Providence, R. I., have developed a high speed, small end mounted wheel grinding attachment which greatly increases the capacity of various well-known makes of light surface grinders without requiring any additional floor space. The attachment may be mounted on surface grinders in two minutes or less in most cases, and without machining, converting surface grinders into high speed precision grinders. They will handle successfully a great variety of intricate grinding jobs—slots, recesses, keyways and hard-to-get-at places. Operating speeds range from 14,000 to 26,000 rpm under load, employing wheels up to 1½" diameter. **901-E**

8 PARTS
PRECISION GROUND
IN One OPERATION

One De-Sta-Co Toggle Clamp holds eight stamped steel gun parts being ground to close decimal dimensions. Another simple, time-saving set-up made possible by quick acting, positive clamping

DE-STA-CO Toggle Clamps

Use when you design fixtures for clamping parts during grinding, welding, machining, reaming, milling, drilling, assembly or other operations. All sizes.

Send for Bulletin No. 43

DETROIT STAMPING CO.
Established Over 25 Years
344 Midland Ave • Detroit 3, Mich.

Penrod Centrifugal Coolant Pumps

Penrod Pumps Easily Applied, Give Better Service

Penrod Pumps are conventional in style but incorporate many new features such as replaceable seal assemblies, totaly enclosed motors, grease sealed ball bearings and streamlined design.

Model P-10h pump (left) uses the motor for mounting and can be located in any position as long as the liquid will flow into the pump by gravity. This pump is easily installed on old or new machines. Model P-30 V Pump (right) is for submerging into the coolant reservoir, and is especially suitable for use with coolants containing abrasives or small chips.

Tanks built especially for Model P-10-¼ and Model P-30 V-¼ Pumps can be supplied promptly.

Model P-10H and Model P-30 V pumps are ready for immediate delivery. Phone or wire us for details

FLOYD PENROD & SONS
TOOL & ENGINEERING COMPANY
P. O. BOX 909 Muncie, Indiana

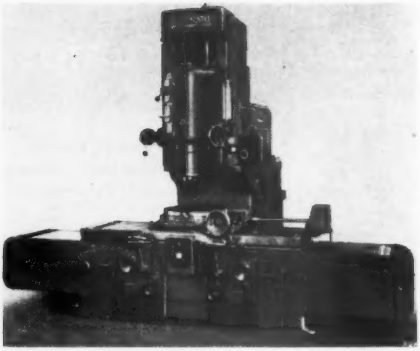
Federal Taperlock Plastic GAGE HANDLES

Federal Plastic Gage Handles give gages a more sensitive touch because they are lighter than any metal. They reduce fatigue and insulate from bodily heat safe-guarding accuracy ● Marked for identification with the same stamps used for marking metal handles ● Ideal for Glass Gages which require handles of light weight for best results, reducing danger of breakage as well as adding to sensitivity ● Available for immediate shipment in 7 Standard sizes and in Red, Yellow, Green and Black for easy identification ● New low prices represent real savings.

A new size is now available—Size 00 for smaller gages.

FEDERAL TOOL CORP. 400 N. Leavitt Street, CHICAGO 12, Illinois

Machine Tool Electronics



A NEW control unit for the No. 4 Vertical Milling Machine has recently been announced by Reed-Prentice Corp., Rockford, Ill. It is a power down feed controlled by electronic speed and torque regulator. This power down feed embodies advantages entirely new in the machine tool field, although its operation has been thoroughly tested and proven in other applications.

The compact electronic unit is mounted on top of the cross slide; the control station is conveniently located near the spindle head. The electronic regulator controls a 1½ hp direct current motor providing smooth, continuous, infinitely variable feed power to the vertical head. The circuit, which is made up of the electronic unit and the controller, has an inherent safety factor providing a natural increase or decrease in motor speed to the selected feed rate. The desired feed automatically holds within a fraction of an rpm.

The circuit is self-braking when control lever is set to "Stop" position. In the event of stalling or jamming, overload protection is supplied for the feed drive.

The circuit operates on 50 or 60 cycle, single phase line in the range between 200 and 600 volts.

Write the Reed-Prentice Corp., Worcester, Mass. for complete details on the electronic control. 746-E.

For RUSH War Jobs Order
Cullman Sprockets
More than 50,000 Cullman Sprockets are available from stock for immediate delivery.
Because of specialized equipment and experience, Cullman Sprockets can be made to your specifications in a relatively short time, and at minimum cost.
Write, telephone, or wire Cullman on any sprocket requirements.
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CULLMAN WHEEL COMPANY
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★ WITH a Rousselle Victory Vise, accurate set-ups are simple—and fast! This is due to many features such as complete, easy-to-read graduations around the entire dial on the broad swivel base—the two convenient locking screws that hold your swivel setting securely—the lock nut on the main screw—extra ruggedness in the broad base, center pin, jaws, ways and screw—all of which assure long-lived precision. The hardened steel screw nut is removable and although the bearing areas on ways and sliding jaw are over-size, a special take-up plate provides constant alignment regardless of wear. Jaw plates are tool steel, hardened and ground. Available with or without swivel base. Point-by-point superiority in every detail has made the Rousselle the choice of experts. Get full data in Bulletin TD-113. Write today.

PROMPT DELIVERY — PRIORITY CERTIFICATION MUST ACCOMPANY ORDER.

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Rousselle Victory Vises are made in four sizes.

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BENTON HARBOR, MICH.

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DEPENDABLE
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Plain Milling Cutters
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Prompt Delivery on Special Tools, Dies, Jigs And Fixtures Made To Your Exacting Requirements

Write for prices on standard sizes or submit blueprints for quotations on special sizes.

Galter Manufacturing Co.
711 W. Lake Street · Chicago, Ill.

Quick Check Hardness Tester

THE illustration shows the Impressor, a portable hardness tester now being manufactured by Barber-Colman Co. The instrument is a quick check tester for use on aluminum, aluminum alloys, soft metals and plastics. It has been designed for use on fabricated parts and assemblies as well as on raw stock.

Operating experience is not necessary when using the Impressor. It is only necessary to exert a slight pressure against the instrument in order to drive the spring loaded indentor into the material to be tested.

The instrument can be used in any position and in any space that will allow for the operator's hand. The dial is conveniently divided into one hundred graduations, facilitating the comparative hardness reading. Readings can be made without stooping, bending or changing positions and can be converted to Rockwell, Brinell and Vickers numbers.

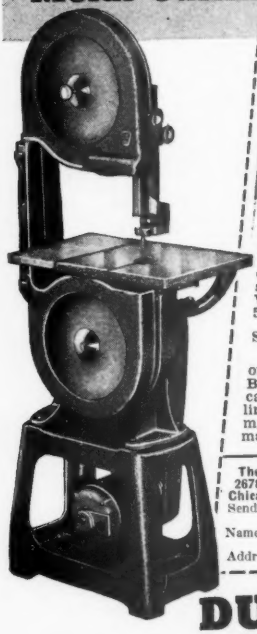
All calibration adjustments of the Impressor are enclosed within the handle which is assembled with two screws set in deep counterbores. These two screws may be sealed to make the instrument tamperproof.

The Impressor weighs 12 ozs. and comes complete with carrying case.

For further details write Barber-Colman Co., Rockford, Ill. 201-E.

A basically improved low-cost

Metal Cutting BAND SAW



WITH MANY EXCLUSIVE FEATURES

Has heavy machined cast-iron trunnion; special roller blade guides which reduce blade crystallization, lessen blade breakage; new design which permits all adjustments to be made from front while saw is in operation; New Departure Ball Bearings; machined dove-tailed ways with adjustable steel gibs; many other features. Can be adjusted to obtain standard wood cutting speeds by a flip of a lever. Metal cutting speeds: 230 and 596 R.P.M. Wood cutting speeds: 2300 and 5960 R.P.M.

Send for New DURO Catalog

for full details and prices on the DURO Metal Cutting Band Saw. Also lists specifications and prices of complete line of DURO low cost metal and wood-working machines.

The Duro Metal Products Company
2678 N. Kildare Ave.
Chicago, Ill.
Send me latest DURO Catalog.

Name .....

Address .....

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MACHINE TOOL DIVISION

ALSO MAKERS OF DURO HAND TOOLS

SCHAUER SPEED LATHES

FOR SPEEDY, PRECISION FINISHING of small metal or plastic parts, Schauer Speed Lathes are a production-economy you cannot afford to overlook—for today's conditions when you are interested in saving time — or for tomorrow's conditions when you may be more interested in saving money! A size and type for every purpose. Write for Catalog 420.

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Rough Turned or Finished Complete

Composite Die Sections ● Extrusion Tools ● Crankshaft Forgings ● Gear Forgings ● Die Casting Dies

Rings, Discs, Blocks, Shafts, Hubs, Bars, and Special Shapes.
Tool Steel of all Makes

S.A.E. and NE Specifications

STAINLESS & COPPER FORGINGS

May We Serve You?

AJAX STEEL AND FORGE Co.

205 ADAIR STREET **DETROIT, MICHIGAN**

INDUSTRIAL DIGEST

(Continued from Page 187)

Prize War Worker

A new kind of war worker has come into American industry within the past few months. He is heartily welcomed wherever he appears and is now being sought by all of the companies familiar with his significant contributions to morale and production.

This newcomer is eager, cooperative, and devoted to his job with a remarkable intensity of spirit and energy. He knows "what it's all about" and reveals by what he does a deep understanding and appreciation of the ultimate meaning and effect of every little detail. This war is his war and he talks and lives each hour as though its outcome depended almost entirely upon him.

We first heard of this new war worker at the Ford bomber plant. Mr. Sorenson was enthusiastic about him and determined to get as many more like him as possible. It appears that improved conditions automatically attend his presence everywhere. His example has a stimulating and highly constructive effect upon the attitude of those who come within the sphere of his influence.

Our manpower problems, it has been said, would be largely solved if every war worker realized as this newcomer does how inexorably and intimately his daily effort, attendance, and results are bound up with our success or failure at the battlefronts.

For this new war worker it is not necessary to conduct rallies or morale campaigns, or continual exhortations. He is on the job regularly and consistently and insists upon giving his utmost. This man as you may have

(Cont'd on P. 188)

When days mean
VICTORY
call for
Johnson
FURNACES
2 WEEKS DELIVERY
No. 120 High Speed Steel Heat-Treating Furnace
A low-cost furnace that is unexcelled for heat-treating high speed steels, for hardening dies, punches and tools. Firebox is 5" high, 7¾" wide and 13½" long. Equipped with Carbofrax hearth, G.E. motor and Johnson Blower. Heavily lined thruout with insulating refractory. Temperature easily regulated. Price—$129.50 F.O.B. Factory.
FREE New Johnson Catalog. Send for yours today.
Offices in All Principal Cities
JOHNSON GAS APPLIANCE CO.
592 E Ave. N. W. Cedar Rapids, Iowa

60% More Parts

WITH A *Barker*

WRENCHLESS CHUCK

Production went up from 75 to 120 parts per hour when the Atlantic Brass Works installed a Barker Two-Jaw Wrenchless Chuck. The part is a bronze plug for a ground key valve. The operations are center, face, and box mill. The lathe is not stopped to set or remove the work.

This step-up in production is typical of new output records being made by users of Barker Wrenchless Chucks and Vises—more parts per hour, lower cost, and less operator fatigue.

You, too, can have continuous and generous dividends by installing Barker Wrenchless Holding Devices. Write today for full information.

Barker Two-Jaw Chuck

Barker Three-Jaw Chuck

Barker Two-Jaw Vise

Barker Three-Jaw Vise

THOMAS HOIST CO.
Chuck Division
20 So. Hoyne Ave., Chicago 12, Ill.

Reg. U.S. **HY-PRO** Pat. Off.

TAPS

High Speed Steel
HAND & MACHINE SCREW TAPS

Clean, Sharp, Accurate Threads for High Production

Cut Thread Taps
•
Commercial and Precision Ground Thread Taps
•
Special Ground Thread Taps

Write for Catalog on Company Letterhead

HY-PRO TOOL CO.
New Bedford, Mass., U.S.A.
489 Mt. Pleasant St. BUY BONDS

INDUSTRIAL DIGEST

(Continued from Page 186)

guessed is the soldier returned from the battlefront, honorably discharged because of some injury or condition which does not prevent his employment in a war plant. He doesn't have to be told; he knows and feels the vital importance of every nut and bolt, every hammer blow and revolving wheel in the battle of production. He is the new prize war worker.

T. K. Quinn, Director-General,
War Production Drive

Salvage Manual for Industry

A new, comprehensive, practical manual entitled "Salvage Manual for Industry" contains 245 pages of systematically organized and classified information and data, most of it of a how-to-do-it nature—on industrial salvage practice in all its ramifications. Material is presented in 26 chapters, grouped into 6 major sections. There are 2 chapters on organizing and planning the salvage department; 3 on the administrative factors; 12 on methods of handling (finding, identifying, segregating, collecting, reclaiming, storing, selling, etc.) metal scrap; 3 on nonmetallic waste; 7 case histories demonstrating exemplary practice; a 17-page compilation of practical hints for handling specific waste materials; and a 9-page index.

The well-illustrated volume was prepared and edited by an editorial board of practical industrial salvage engineers and business paper editors and is available from the Technical Service Section, Industrial Salvage Branch, Salvage Division, WPB, Washington, D.C.

(Cont'd on P. 190)

Faster, Better DE-BURRING, FINISHING, POLISHING . . . In Fewer Operations

Brightboy offers you outstanding time and work savings, plus quality, precision finish, because it is made of *resilient rubber*. The rubber is *impregnated throughout* with the abrasive. In use, the abrasive recedes slightly into the rubber, cushioning the abrasive action. Degree of finish is achieved by regulating the machine speed, or in manual operations, the hand pressure. Brightboy's versatility and simplicity eliminate many in-between operations; a Brightboy finish frequently serves as a final polish.

Ask your distributor for Methods and Applications Data, catalogs and prices. Brightboy field representatives are at your service.

BRIGHTBOY INDUSTRIAL DIVISION

Weldon Roberts Rubber Co. — **Newark, N. J.**

WELDON ROBERTS
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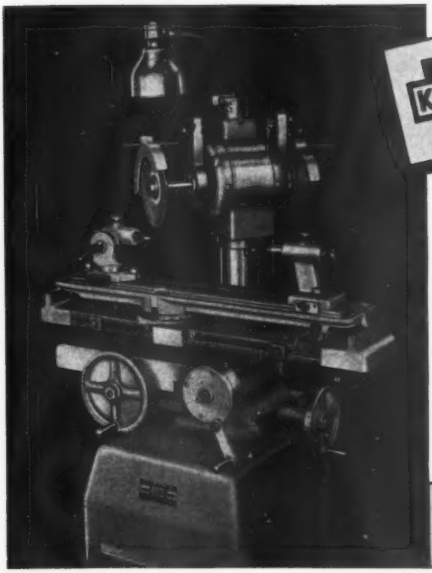


KNOCK-OUT

The New

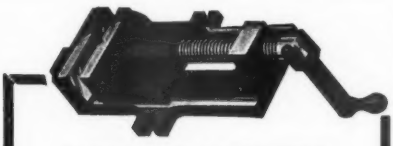
K-O UNIVERSAL TOOL GRINDER

now coming off the assembly line. Maintenance or production with speed, accuracy, and dependability at minimum capital outlay.

Write for Bulletin UTG-43-TD.

K. O. LEE COMPANY

ABERDEEN SOUTH DAKOTA



YOST DRILL PRESS VISE

This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.

Offered in two sizes.

Vise No.	Width of Jaw, Inches	Opens Inches	Weight Pounds
1D	3½	3½	12½
2D	5	5½	23

Do you need a vise of ANY type?

Write today for bulletins on the extensive Yost line

YOST MFG. COMPANY

1000 MAIN ST.

MEADVILLE, PENNSYLVANIA

FREE TO EXECUTIVES

for EMPLOYEE TRAINING

You will say, like hundreds of others, this is the best book for its purpose ever printed. Employees like it because it's clearly illustrated—easy to read. Tells how to use gage blocks, sine bar, vernier instruments. Chapter on history of measurement, care of gages, etc. Write on your letterhead. No charge of course.

JANSSON GAGE COMPANY

19212 Glendale Ave. Detroit 23, Michigan

INDUSTRIAL DIGEST

(Continued from Page 188)

Story of Stainless Steel Told in New Motion Picture

An interesting new motion picture has just been released by the Bureau of Mines titled, "Stainless Steel". Produced in cooperation with the Allegheny Ludlum Steel Corporation, this unique film graphically traces the intricate production process of Allegheny Metal—the corrosion-resistant steel that combats costly rust. In special prevue showings of this new industrial screen feature, technicians and laymen alike have acclaimed the adroit way in which elements of entertainment and instruction have been blended to achieve a fast-moving drama of industrial progress.

The product itself, Allegheny Metal, long familiar in modern American kitchens, stream-lined trains and elsewhere, is now serving war needs exclusively. The theme of the picture is established by depicting a simple experiment contrasting the corrosion-resistance of Stainless Steel as compared to ordinary steel. The superior qualities apparent in stainless steel are then explained through a series of unusually interesting scenes which permit a visual tour through the giant Allegheny Ludlum Plant in Brackenridge, Penna.

You see an electric furnace charged with raw materials; the addition of carefully measured amounts of chromium and nickel to produce different grades and types of Allegheny Metal. You have a ring-side seat as the charge begins to melt and bubble; as sample ingots are taken from the molten mass. You follow the process to the soaking pits, thence to the immense rolling mills and shears until the finished product is ready for the manufacture of any one of the numerous stainless steel products essential to war or peacetime America.

The film "Stainless

(Cont'd on P. 192)

in the **HEAT OF BATTLE**

EXPERT STEEL TREATING PAYS!

Our Services

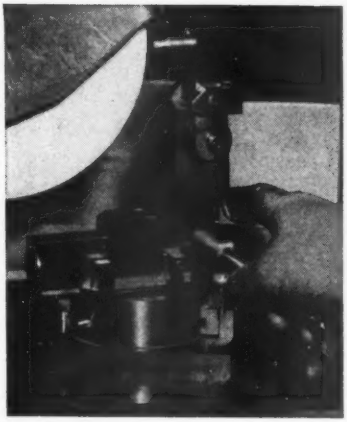
Flame Hardening . Annealing . Aerocasing . Bar Stock Treating and Straightening . Heat Treating . Pack or Gas Carburizing . Sand Blasting . Chapmanizing . Tempering . Cyaniding . Nitriding . Hi-Speed Hardening

METAL TREATING INSTITUTE

THE LAKESIDE STEEL IMPROVEMENT CO

5418 Lakeside Avenue CLEVELAND, OHIO Phone Henderson 9100

A RADII & ANGLE DRESSER
OF PRECISION AND VERSATILITY



MODEL B

An instrument of precision and versatility . . . Operation is simple, requiring no high degree of skill for accuracy . . . Any one of the following can be produced with one setting:

One angle
Two angles
Concave radii up to 6″
Convex radii up to 4½″
Two Angles and radius.

Many other diversified forms to meet requirements.

Wheel size capacity—4″–14″ dia.; angular travel—3″; base—4″ x 5″; height—diamond from base, 7½″; for use on universal surface and cylindrical grinders.

Full details available on request.

MANUFACTURED BY
J & S TOOL CO. 477 Main St., East Orange, N. J.
PRECISION DRESSING TOOLS

The Cleveland Tool Engineering Co. has moved into new and larger quarters at 1261 W. Fourth St., Cleveland 13, Ohio, with increased facilities for the manufacture of circular relief grinders and universal indexing heads.

UNIVERSAL MIKRO-LOK PRECISION BORING BARS . .

Here is the Boring Bar of 101 uses. Universal Mikro-lok Boring bars can be adjusted to limits of .0005 or less as quickly and accurately as a micrometer. Extremely rigid. Available with taper shanks for Swiss Jig Boring Machines and with Morse shanks, straight shanks, and a variety of flanges for Diamond Boring machines. Write for catalog.

UNIVERSAL ENGINEERING
FRANKENMUTH,
MICHIGAN

(Continued from Page 190)

Steel" is admirably suited for use by industrial and civil defense training classes, training classes conducted by the armed forces, and for schools, colleges, churches, civic and business organizations.

Applications for free short-term loans of "Stainless Steel" should be addressed to the Graphic Services Section, Bureau of Mines, 4800 Forbes Street, Pittsburgh, 13, Pennsylvania, and should state specifically that the borrower has a sound projector for 6 millimeter film.

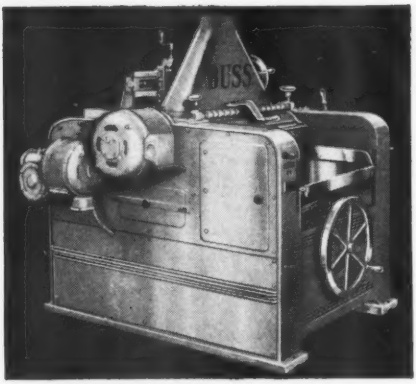
Positions Arbor on Gear Cutting Machines

An adapter devised at GE's Schenectady Works makes possible faster and more accurate positioning of small arbors used on gear shapers for cutting small precision gears. Formerly, when dial indication showed that a new or old arbor was eccentric by more than 0.0002" with the work spindle another arbor had to be made. Because there was no spindle adjustment, much time was required of lathe operators either to make a new arbor or re-machine the old one within the allowable run out.

The newly devised adapter is bolted to the work spindle of the shaper. It is circular in shape with a hub protruding from each face. Its tapered bore conforms to the taper of all relative arbors, and it has three holes with ample clearance for bolting it to the spindle.

When an arbor is inserted in the adapter a 0.0001" dial indicator is used to reveal run out. The arbor and adapter are moved about the bolt holes until the indicator shows it to be perfectly concentric with the cutter and work spindle. The adapter is then bolted fast, and perfect accuracy of new or repetitive work is assured.

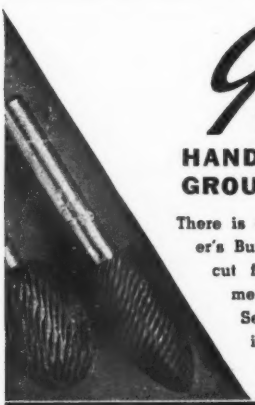
BUSS *Wood Surfacers*



GIVE YOU THE ABSOLUTE PRECISION ESSENTIAL IN PATTERN AND JIG MAKING!

—plus faster change-over, greater convenience of operation and the assurance of years of perfect service. Write for Bulletins Type 4-L showing the many patented features which make this the finest of all surfacers for pattern and jig departments. Production Models to suit every circumstance. We specialize in surfacers.

BUSS MACHINE WORKS
214 EIGHTH ST. HOLLAND, MICH.



Grobet

ROTARY FILES

HAND CUT — MILLED CUT
GROUND FROM THE SOLID

There is a Grobet Rotary File, Cutter, Diesinker's Bur in shape, size, and coarseness of cut for every type of hard or soft metal, plastic, wood, etc.
Send for Catalog Y. R. illustrating the complete line in full size, speed charts, etc.

GROBET FILE CO. of AMERICA

421 Canal Street 1812 F. L. GROBET 1943 **New York 13, N. Y.**

IMPORTERS OF GROBET SWISS FILES — MFRS. OF GROBET ROTARY FILES

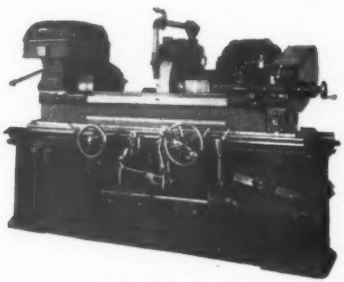
HILL-CLARKE

Modernized

CYLINDRICAL GRINDERS

for **SUPER-GRINDING**
and **MICRO-FINISH**

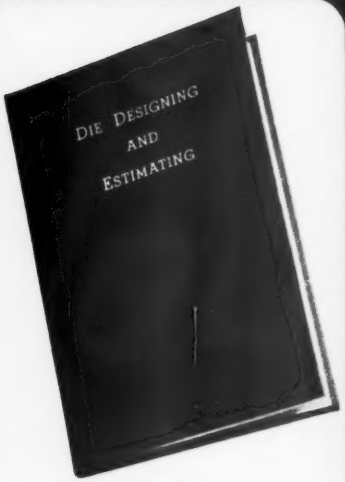
Hill-Clarke Modernized and Motorized Cylindrical Grinders offer refinements in design which minimize vibration and assure extreme accuracy on all grinding operations. One of these refinements, the Hill-Clarke Patented Multiple V-Belt Drive to work spindle, contributes to the smoothness in operation which makes possible a finish within a few micro-inches even when using standard grain free-cutting wheels. Investigate today by sending for a copy of the Hill-Clarke catalog "Super Grinding."



SIZES AVAILABLE

10x28	10x50	14x50	16x72
10x36	10x72	14x72	18x96

HILL-CLARKE MACHINERY CO.
646 WASHINGTON BOULEVARD CHICAGO 6, ILL.



DIE DESIGNING AND ESTIMATING

CONTENTS

New Chapters include: Progressive Dies; Compound Dies; Drawing Dies (*Deep drawing section on cartridge case design, mathematical and graphical methods of determining diameters, shell wall thicknesses, punch and die sizes*)
Outline of Equipment and Operations for Manufacture of Small Arms Cartridge Cases.
15 New Estimating Tables.
Separate Index of Time Value Tables.
150 Practical Points on Die Designing and Building.

★ **"Will be extremely helpful to us . .", "very practical", "even better than I had hoped it would be" — these are comments by men in the precision tooling industry who have examined the new second edition of "Die Designing and Estimating". Orders for 50 copies (most on a second order after the book was reviewed) from a public library, 28 copies from an airplane manufacturer, 24 from an apprentice training instructor testify to the usefulness of this book. Largely written on request by specialists, the book covers its subject concisely, systematically and with authority.**

The 160 pages have over 125 drawings, charts and photographs carefully selected to illustrate modern die designing practice. The estimating data (largely that of George Dannes) is complete enough to follow from rough sketch to a final, sound estimate.

Send for your copy today. Price $3.00 per copy plus postage. Write for quantity discounts.

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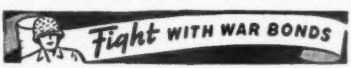
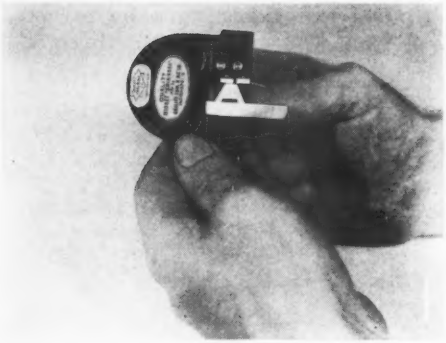
AMERICAN PHOTOCOPY EQUIPMENT CO.
2849 N. Clark St., Dept. AA-11, Chicago 14, Ill.



To meet the demand for their line of diamond pointed and tungsten carbide tools, E. Karelsen, Inc. have moved into their large modern plant at 125 W. 45th St., New York City.

UNIVERSAL
FLOATING
CHUCKS •
Universal Floating Chucks are the ideal tools for drilling, counterboring, reaming or piloting from a lead hole. Adjustable spring pressure compensates for tool weight, allowing increased feed without danger of marred holes. Designed for horizontal operation in screw machines and turret lathes. Write for facts on Universal Floating Chucks, Standard Chucks and Centering Chucks.
UNIVERSAL ENGINEERING
FRANKENMUTH,
MICHIGAN

Kwik-Chek Inspection Gages



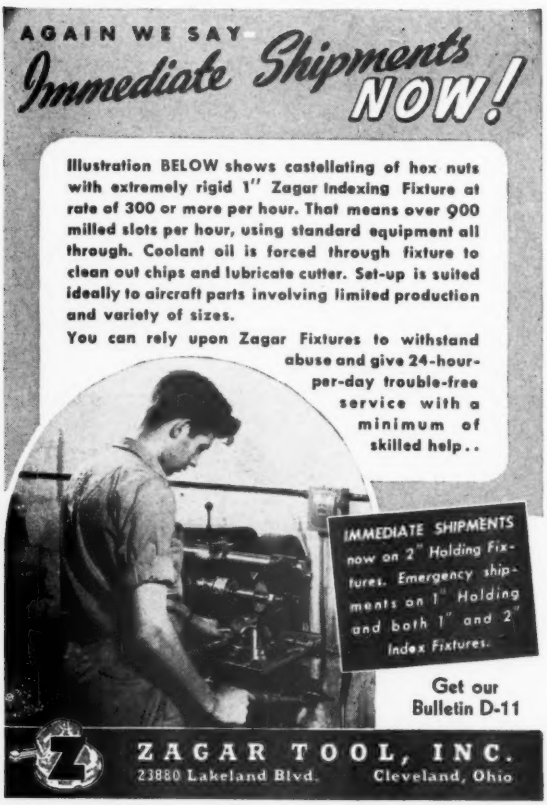
CLEAR foresight and careful planning on the part of Quality Tool & Die Co. officials have resulted in the development of a complete line of precision gages to be used in the manufacture of armaments.

One of the outstanding gages in this line is the "Kwik-Chek". This is an adjustable limit snap gage so designed that the work can be set on lower anvil and properly lined up before presenting it to the gaging buttons. It is particularly adaptable for checking and measurements of any kind and for gaging odd and irregularly shaped pieces.

"Kwik-Chek" gages are built with a non-influencing clamping boss, permitting them to be clamped in a vise or holding fixture without impairing their accuracy. The lower anvil extending beyond the back edge of the top gaging button helps in gaging counterbored work.

"Kwik-Chek" gages are available in two types—Heavy Duty and Midget. The former is fast, rugged and accurate with a range of .0" to 6¼". The Midget type, illustrated above, is for fast hand checking (Range .0" to .760"). Both models are furnished in a choice of round or square head gaging buttons.

A well-illustrated catalog can be obtained by writing Quality Tool & Die Co., N. Noble and E. Vermont, Indianapolis 2, Ind. 785-E.


AGAIN WE SAY—
Immediate Shipments NOW!
Illustration BELOW shows castellating of hex nuts with extremely rigid 1" Zagar Indexing Fixture at rate of 300 or more per hour. That means over 900 milled slots per hour, using standard equipment all through. Coolant oil is forced through fixture to clean out chips and lubricate cutter. Set-up is suited ideally to aircraft parts involving limited production and variety of sizes.
You can rely upon Zagar Fixtures to withstand abuse and give 24-hour-per-day trouble-free service with a minimum of skilled help..
IMMEDIATE SHIPMENTS now on 2" Holding Fixtures. Emergency shipments on 1" Holding and both 1" and 2" Index Fixtures.
Get our Bulletin D-11
ZAGAR TOOL, INC.
23880 Lakeland Blvd. Cleveland, Ohio

Empire LIVE CENTER
WITH REPLACEABLE POINT

VERSATILITY

ACCURACY • HIGH SPEED • HEAVY DUTY

A. Very large, for pipe or tubing work
B. Extra long point used in facing operations
C. Extra wide point for large diameter work
D. Standard point
E. Blank made of soft tool steel for nests
F. Female for work not having centers

THE TAPERED SEAT ASSURES ACCURACY OF ± .0001

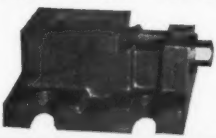
FISHER
TOOL COMPANY
226 LAFAYETTE STREET
NEW YORK 12, N. Y.

MODEL 3 CONTOUR GRINDER

For economical, rapid and accurate grinding and polishing of contours or irregular shapes.
Capacity, diameter of wheels—½" to 4". Capacity, face of wheels—2", 2½", 3". Diameter of table—18".
Vertical reciprocation movement of spindle—5/16".
Quickly - mounted diamond dresser is standard equipment.

Write for folder of complete details.

No. 43 LEVELING JACK



Maintaining of machines level on foundations is important to accuracy.

Write for circular.

BAKER *Brothers, Inc.*
Drilling, Boring, and Tapping Machines TOLEDO, OHIO

Precision Surface Plates of Granite

AFTER extensive research, The Herman Stone Co. has proved the adaptation of granite to precision surface plates to be a very successful venture. These plates are for precision use in inspection departments and are economical to use in the tool room and production departments.

The working surface of each Precision Granite Surface Plate is processed flat while being supported at three points. These supports remain on the plate permanently so the plate can only be used in the manner in which it was finished. The plates will not rust, corrode or warp and they are finished to 1/10,000" over all. They can be successfully used at, or near, grinding machinery without the surface becoming charged with abrasive particles. It is sufficient to merely wipe off the surface and the plate is ready for immediate use.

The almost diamond-hard surface of the precision granite surface plate is practically indestructible under normal conditions, assuring many years of accurate service. The specially treated, non-abrasive qualities assure practically no wear on the finest tools.

Another distinct advantage is that the supply of this type of granite is unlimited and is not an essential war material, thus releasing more metal for important war work.

The Herman Stone Co. Dept. 10-J, Dayton, O., will send ful particulars on request. 669-E.

★

About 700 essential civilian products must be produced in 1944 in order to provide the civilian population with items necessary to health, safety and general welfare. It is contemplated that these items must be produced in part by small manufacturers who have made these items in the past.

Certain steps must be taken to qualify for participation in this program. Manufacturers should contact their nearest Smaller War Plants Corporation office.

The HEAD that puts Production AHEAD

When production must roll at full speed, you'll find the knurled heads a big help. Fingers grip them without slipping, when using

KNURLED

UNBRAKO Reg. U.S. Pat. Off.

SOCKET HEAD CAP SCREWS

SIZES No. 4 to 1½" DIAM.

. . . so screws can be turned faster and farther before a wrench is needed. Knurling also permits making adjustments with pliers where a wrench may be inconvenient. It also makes possible locking the screws after countersinking. We'll gladly tell you how.

. . . Over 40 Years in Business . . .

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA. BOX 600

— BRANCHES —

BOSTON • DETROIT • INDIANAPOLIS • CHICAGO • ST. LOUIS • SAN FRANCISCO

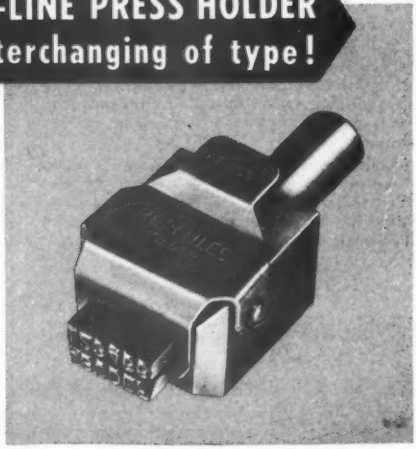
KEEP SPOILAGE DOWN
Rawhide
Hammers & Mallets
Replacement insert faces for C/R Hammers sold by leading supply houses.
KEEP PRODUCTION UP

Coiled Mechanical Rawhide absorbs shock without fatiguing recoil. Delivers effective, forceful blows without crashing, battering or marring. Speeds assembly, die setting, machine adjustment, motor repair and maintenance work. Keeps production up and spoilage down.

Write for Catalog Sheets

CHICAGO Rawhide MFG. CO.
1280 ELSTON AVE.. ★ CHICAGO. ILLINOIS.

HERCULES DOUBLE-LINE PRESS HOLDER
permits instant interchanging of type!



The ACROMARK two-line holder is probably the most durable unit available today. Holding either type or logotype, dies are quickly removed or interchanged by mere pressure of the thumb. Oversize construction and heavy shoulder type (exclusive with ACROMARK) gives extra strength needed to withstand impact when marking steel. Holder illustrated takes two lines of ¼" type.

ACROMARK
THE ACROMARK COMPANY
515 MORRELL STREET, ELIZABETH, NEW JERSEY

Literature describing the complete ACROMARK line of marking, numbering and stamping equipment and accessories is available on request. Whatever your marking problems, ACROMARK technicians will be glad to collaborate in an efficient, economical solution.

Boyar-Schultz

Profile Grinder No. 2

For Larger and Heavier Contour and Profile Grinding

We do not know how much it may cost to be WITHOUT a Profile Grinder. But we DO know that a small amount of grinding and fitting of difficult contours will soon pay for a Boyar-Schultz Profile Grinder.

And that is not all . . . mechanics quickly discover the full capacity of this machine tool. Both in the tool room and in production, many jobs find their way to this grinder instead of to other types, where time-consuming set-ups are necessary.

Made in two styles — with Dual Spindles as shown above, and with Single Spindle. Both spindles operate at the high speed of 10,000 R.P.M. assuring efficient grinding, even with wheels of small diameter.

A PRODUCTION JOB

A ground and polished internal surface, having six different radii. Finishing was successfully accomplished in minimum time with Boyar-Schultz Profile Grinder No. 2.

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BOYAR - SCHULTZ CORPORATION

2112-M Walnut Street Chicago 12, Illinois

EFFICIENCY for the PRODUCTION BATTLEFRONT

Speed Up Victory with "Oliver"

The tool behind the tool that does the job will help to speed up your production. 100% efficiency can be obtained only with tools that are well sharpened and kept in perfect condition. Speed up production by faster sawing and filing operations with Oliver Die Making Machines. They save 50% to 60% of the labor over hand methods in the cost of making precision Dies, Gages, Cams, Templates and similar products requiring rapid and accurate sawing, filing and lapping operations. It will pay you to investigate the line of Oliver Die Making Machines!

Send for descriptive literature today!

OLIVER INSTRUMENT COMPANY

1436 Maumee St., E. -:- Adrian, Mich.

"TIME SAVER"

Improved holder with interchangeable steel type makes part number changes a simple operation. Guaranteed for years of service.

Used by hand or press, it's a time and money saver.

PROMPT DELIVERIES

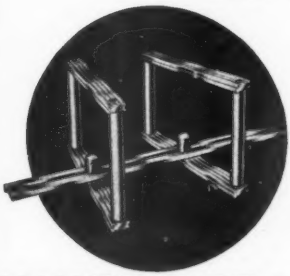
STOCK SIZES:
TYPE #1
TYPE #2
TYPE #3

SOSSNER

161 GRAND STREET
NEW YORK 13, N. Y.

Safe, Adjustable PARALLELS

That Speed Precision Operations . . !



IMMEDIATE DELIVERY!

★ Get rid of the obsolete, dangerous method of slowly building a foundation for drilling, tapping, boring, milling, grinding and other precision operations.

Do it the war-time way . . . the safe and speedy way . . . with Acro *adjustable* PARALLELS. They are made in three sizes and handle a wide range of work.

Used in America's Big War Plants

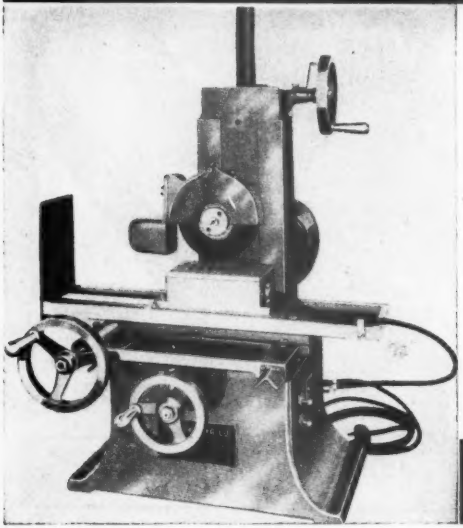
These modern PARALLELS have become standard equipment in many of America's leading war plants . . . your assurance that PARALLELS by Acro will do much toward speeding precision operations in your plant. Act now!

See Your Jobber or Write Direct for Same Day Shipment!

ACRO TOOL AND DIE WORKS

4894 N. Clark St. IRVing 8500 Chicago, Ill.
Precision Machinists ● Tools ● Dies ● Metal Specialties

Sanford precision bench surface grinder



A
HIGH SPEED GRINDER
FOR ALL
SMALL PRECISION WORK

★

Write for
Specifications
Bulletin No. C

★

PROMPT DELIVERY

SANFORD MFG. COMPANY
1279-81 SPRINGFIELD AVE., IRVINGTON 11, N.J.

BARTELT
NEW MODEL "C"
PEDESTAL INDICATOR

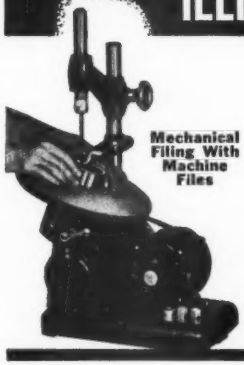
Specially designed for accurately resetting precision boring bar tools, and for similar work. The upright has a vee base, with flats for working off a plane surface. The indicator, reading to ten-thousandths of an inch, has an adjustment of 1" along the slot in which it is clamped. This gage is intended for fixed setting to check precision tools on production jobs, and thus speed up resetting of tools after replacement or resharpening.

Write for new Circular

Showing all models, "A", "B", and "C", of Bartelt Pedestal Micrometers and Pedestal Indicators together with specifications and list prices.

BARTELT
ENGINEERING COMPANY
1212 PARTRIDGE AVE.
BELOIT • WIS.

ILLINOIS DIE FILING MACHINE



Reduce costs and improve quality with this TRIPLE-PURPOSE Machine

A versatile bench type machine for all three major production steps in the die-making process—sawing, filing and stoning. Quality built throughout to stand up longer and produce more accurate work. Forced-feed lubrication plus hardened and ground shafts running in bronze bushings combine to minimize wear and prolong life. Maintained accuracy is secured through holding chuck and clamping device which provide positive file alignment, and balanced moving parts which operate without vibration. ***Write for descriptive literature.***

ILLINOIS TOOL WORKS

Manufacturers of Metal Cutting Tools and Shakeproof Products

2501 N. Keeler Avenue **Chicago, Illinois**

IN WAR OR PEACE

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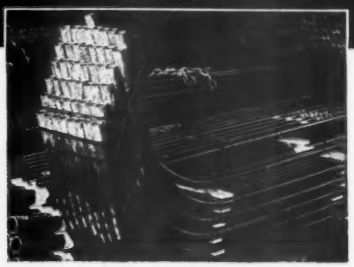

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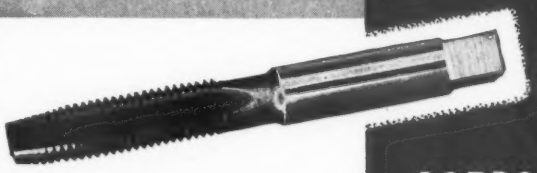

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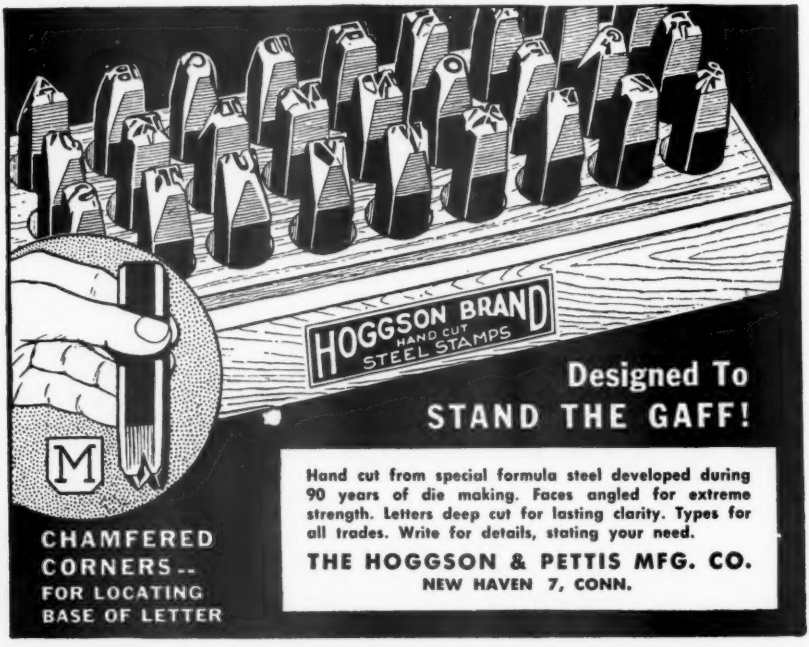

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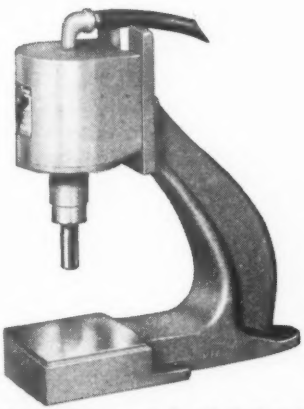

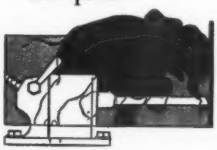

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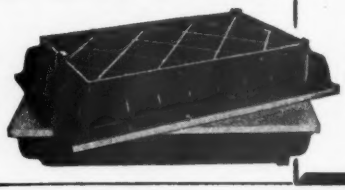

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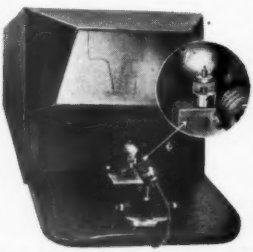

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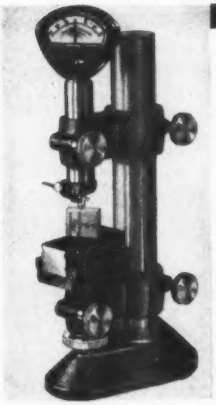

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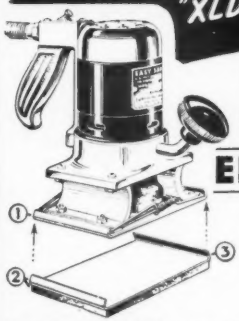

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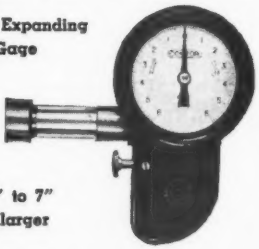

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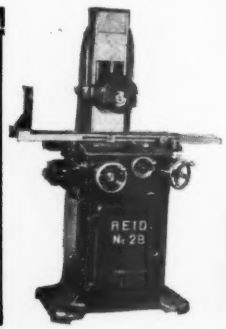

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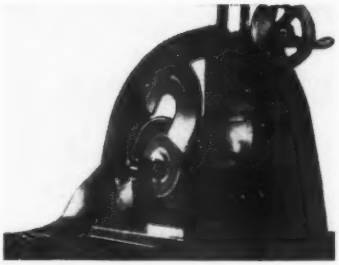

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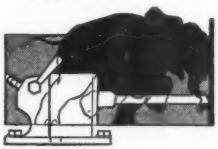

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CARBIDE ROLLER TURNER TOOLS

by R. D. Mack

Carboloy Company, Inc.

AS rapidly as the use of carbide tools has become an accepted practice for any specific type of application, such tools have been either "standardized" for mass production or have become "design standards" for carbide tool engineering.

Among the newer design standards are the "roller turner" tools intended for use with Warner & Swasey and Gisholt lathes. The demand for such tools has become unusually pronounced during the past year as the result of the many bar stock turning operations required in the manufacture of war products.

The basic principles of application of carbide tipped roller turner tools do not differ fundamentally from accepted carbide tool application practice. The following factors must be taken into consideration however if such tools are to be used to their maximum efficiency.

Setting of Tool and Roll

Carbide roller turner tools should best be set on a radial centerline of the work or slightly above. Tools set too far above the center will have insufficient front clearance which results in excessive tool wear. Tools set below center will have excessive front clearance and insufficient support under the nose.

Unless a diameter must be turned accurately concentric with a previously finished diameter, the rolls should be set to follow the tool. The advantage of this practice is that the rolls will then help in attaining a good finish on the work.

To assure that the rolls will ride on a finished and smooth cylindrical surface and engage as soon as possible after the tool starts to cut, they should be set from $\frac{1}{64}$" to $\frac{1}{32}$" behind the high point of the nose radius of the tool.

To determine whether the pressure of the rolls against the work is correct, place the thumb against the rolls with the work revolving and the feed disengaged so that the tool is not engaged in the cut. A light thumb pressure should stop the rolls from turning when the roll pressure is properly adjusted. With insufficient or unequal roll pressure the work can be forced out of true by the thrust of the cut.

Speeds and Feeds for Cutting Steel

The usual practice in lathe work with Carboloy tools for cutting speeds and feeds is applicable to roller turning. In general, the cutting speed for steel should be over 200 feet per minute, the feed .015" to .030" per revolution. The speed should be kept sufficiently high to produce a shiny finish on the work. Too slow a speed will leave a ragged surface and also the tool life will be shortened.

To obtain a fine finish on the work the feed may be decreased to .008" to .012". Feeds less than those amounts will subject the tool to excess wear due to the increased rubbing action.

Tool Shape

Although only the design of Carboloy roller turner tools for both Warner & Swasey and Gisholt type lathes has so far been standardized, the same design principles apply to tools for other machines. The major differences will be in

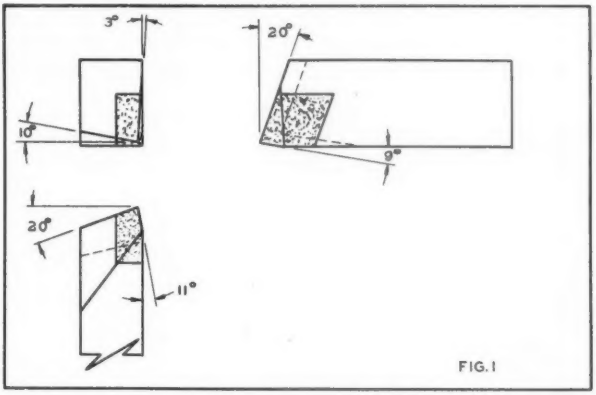


Fig. 1—Roller turner tool for turning to a 90° shoulder.

tool shape details controlled by the sizes of, and the angles incorporated in, the tool slot of the roller turner used.

For illustrative purposes the standard design roller turner tools for Warner & Swasey lathes will be dealt with in detail.

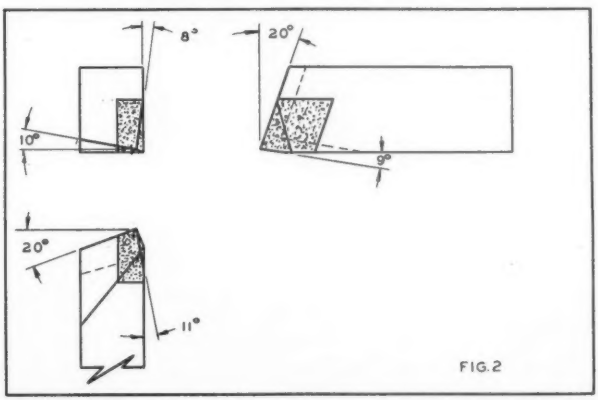
Figure 1 illustrates the standard tool design for turning to a 90° shoulder. The cutting edge forms a 3° angle with the shank. This angle is necessary since the tool shank is held at a compound angle in relation to the work.

Figure 2 similarly illustrates an 8° angle at the cutting edge to produce a 5° lead angle with relation to the work. This angle is desirable for heavy cuts when a 90° shoulder is not required.

The other tool angles shown are such as to produce the recommended back rake and front and side reliefs when the tool is set on center or slightly above. With tools held in this manner, the effective back rake will be approximately 5° and both front and side relief will be approximately 7°. An advantage of the

(Continued on Page 216)

Fig. 2—Roller turner tool for heavy cuts.



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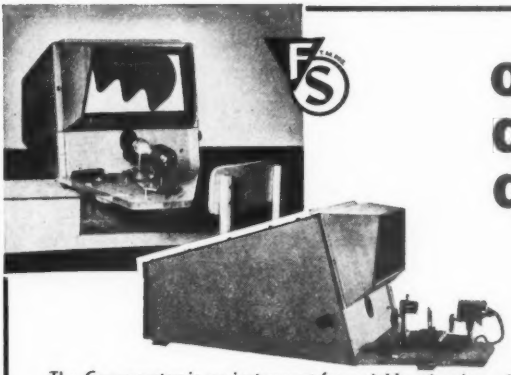

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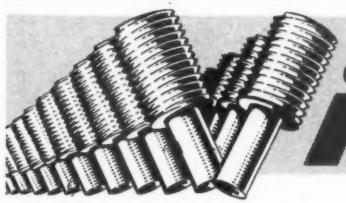

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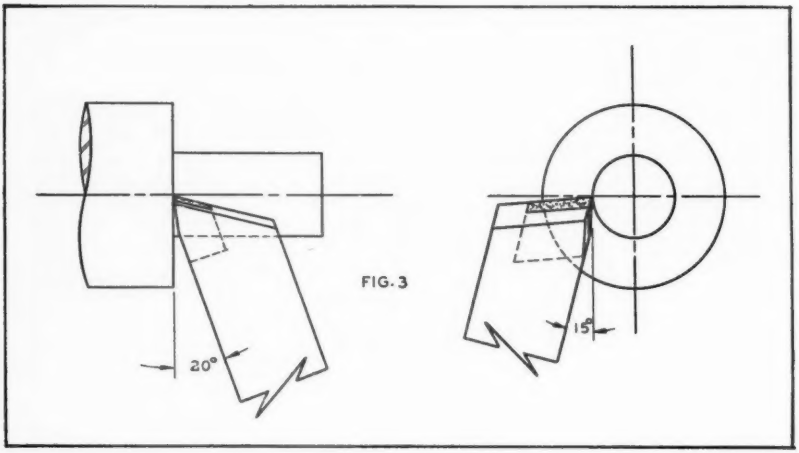

FIG. 3

Fig. 3 — Setup of a properly ground roller turner tool in a W. & S. holder.

(Continued from Page 213)

5° back rake is that it promotes free chip flow away from the tool and thereby reduces the possibility of chips interfering with the rolls. This point is especially significant when turning small diameter work where the space between the tool and the rolls is limited.

Figure 3 shows the tool setting that obtains due to the compound angle of the tool holder.

The nose radius should be approximately $\frac{1}{64}$" for maximum tool life.

Chip Breakers

Roller turner tools today are used almost exclusively for cutting steel. For this operation they must have chip breakers to coil the chip and direct it away from the tool and rolls.

Ground-in chip breakers similar to those used in some high speed steel roller turner tools are practical for Carboloy roller turner tools. The side rake angle is easily incorporated in the chip breaker surface of these tools.

Two common styles of chip breakers are illustrated in Figs. 4 and 5. An advantage of the gullet type shown in Fig. 4 is that it is very effective in directing the chip away from the work. Also advantageous is the fact that any nicks in the cutting edge developed during the grinding of the faces will be removed by the grinding of the land. The ledge or "step" type chip breaker (Fig. 5) has the advantage of being simple to grind.

The dimensions shown in Fig. 4 and Fig. 5 for various cuts and feeds are intended as guides only. Minor deviations are necessary to suit the requirements of steels of various grades and hardnesses.

The sharp edge at the shoulder of the chip breaker should always be removed with a hand hone. A sharp edge would scrape fine shavings from the chip. These shavings tend to spoil the finish of the work when they are carried between the work and the rolls.

Grinding Sequence

The sequence of grinding operations for tools having the chip breaker shown in Fig. 4 should be:

1. Relieve steel from the vicinity of the surfaces to be finished.

2. Grind front and side relief or clearance surfaces.

(Continued on Page 220)

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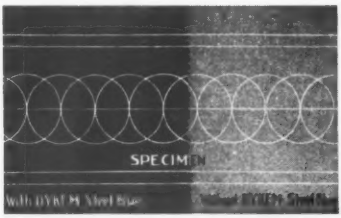

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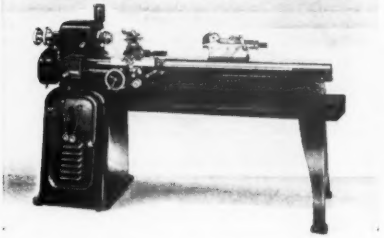

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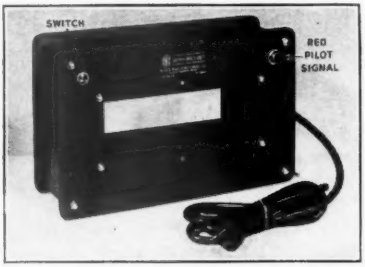

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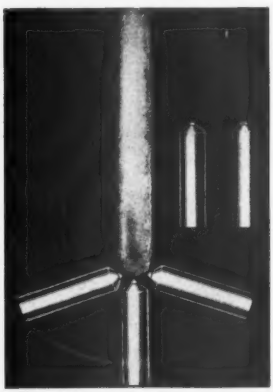

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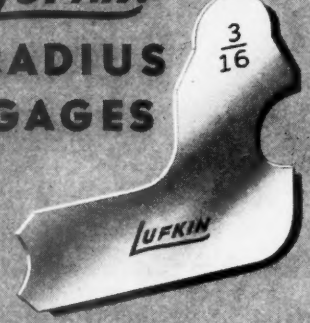

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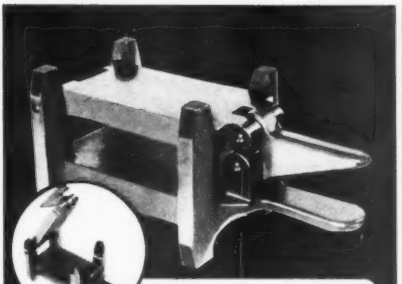

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(Continued from Page 216)

3. Grind chip breaker.
4. Grind land and top face.
5. Grind nose radius.
6. Hone front edge of tool and shoulder of chip breaker to remove sharp edges.

The sequence of grinding operations for tools having the chip breaker shown in Fig. 5 should be:

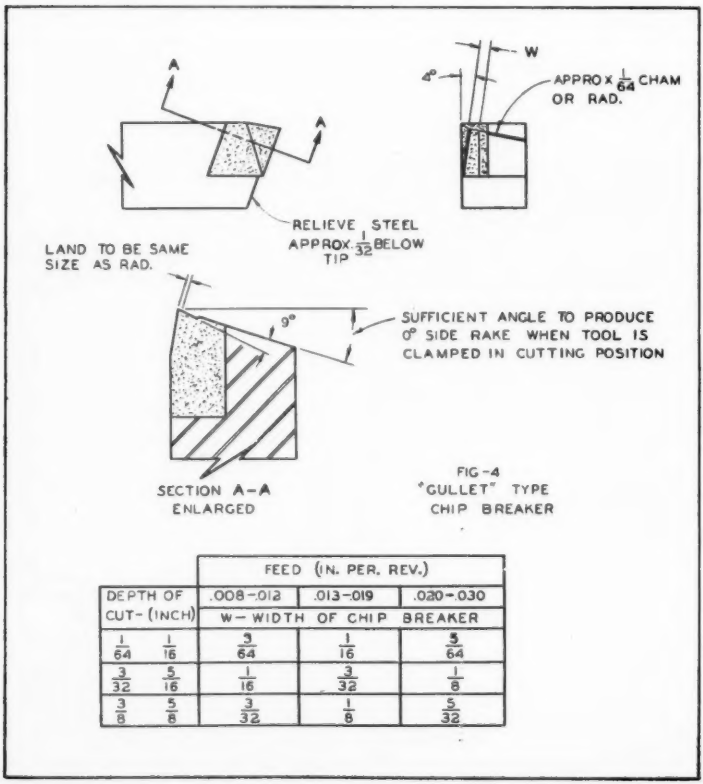
1. Relieve steel from vicinity of surfaces to be finished.
2. Grind top faces.
3. Grind chip breaker.
4. Grind front and side relief or clearance surfaces.
5. Grind nose radius.
6. Hone front edge of tool and shoulder of chip breaker to remove sharp edge.

To obtain the proper angles in all machine grinding operations, the tool should be held in a universal vise or in a special fixture which automatically presents the tool to the grinding wheel at the angles required for the individual roller turner used.

The front and side relief or clearance surfaces should be ground on a 100 grit silicon carbide or diamond wheel of the cup type. This can be done by hand or machine grinding. Time may be saved, where a large amount of carbide must be removed, by hand grinding on a

(Continued on Page 224)

Fig. 4—Gullet type chip breaker as used on roller turner tools.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A
W
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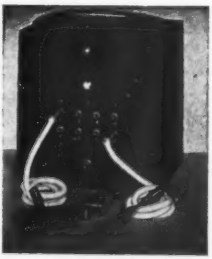
SECTION A-A ENLARGED
FIG-4 "GULLET" TYPE CHIP BREAKER

DEPTH OF CUT- (INCH)		FEED (IN. PER. REV.)		
		.008-.012	.013-.019	.020-.030
		W- WIDTH OF CHIP BREAKER		
1/64	1/16	3/64	1/16	5/64
3/32	5/16	1/16	3/32	1/8
3/8	5/8	3/32	1/8	5/32

Etchograph



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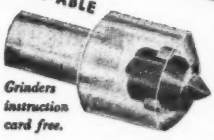

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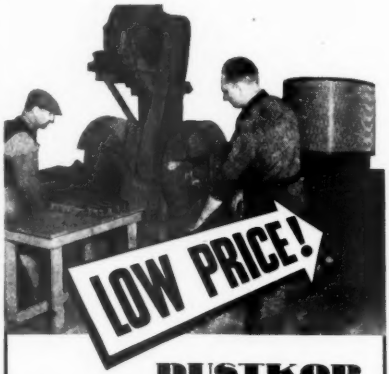

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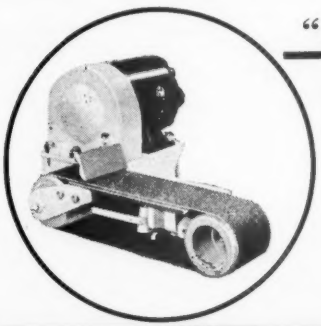

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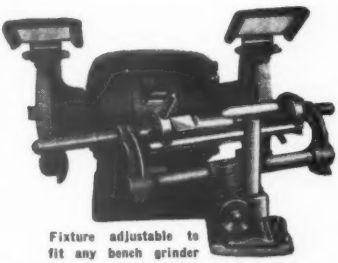

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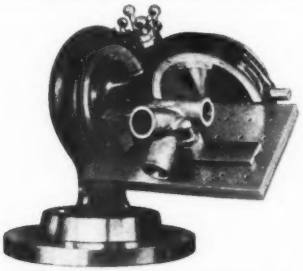

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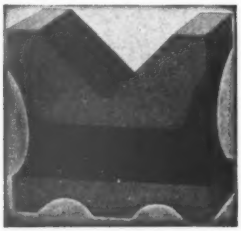

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(Continued from Page 220)

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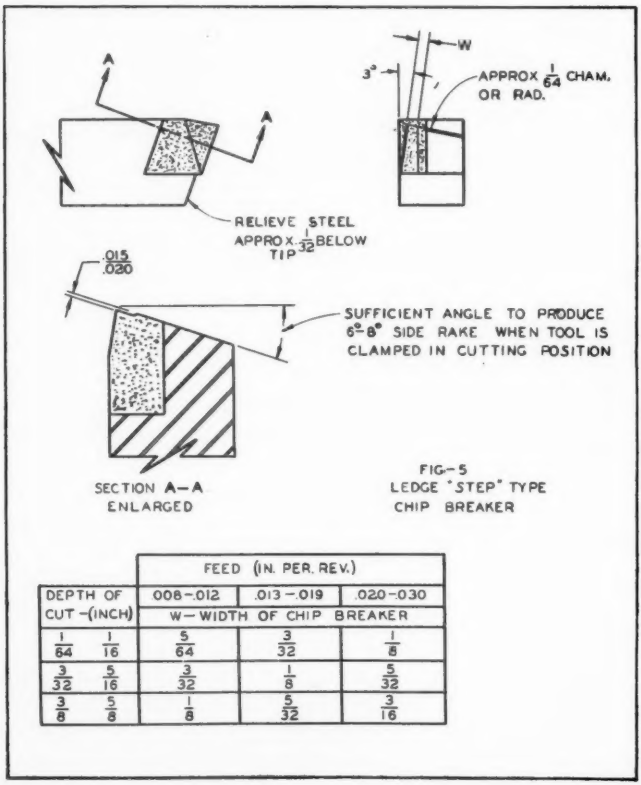
To produce a smooth land and a keen edge in grinding the top face of the Fig. 4 type of tools, the wheel should be set at right angles to the cutting edge with the direction of rotation against this edge. For tools not having a land, as in Fig. 5, the wheel orientation and direction of rotation is optional since the cutting edge lies below the top face.

The nose radius should be ground by hand. A good even curve can be formed by grinding several small flats approximately tangent to the radius and then using a hand hone to round off the high points.

Fig. 5—Ledge or "step" type chip breaker for roller turner tools.



DEPTH OF CUT—(INCH)		FEED (IN. PER REV.)		
		.008–.012	.013–.019	.020–.030
		W—WIDTH OF CHIP BREAKER		
1/64	1/16	5/64	3/32	1/8
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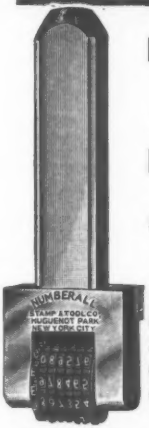

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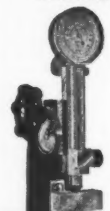

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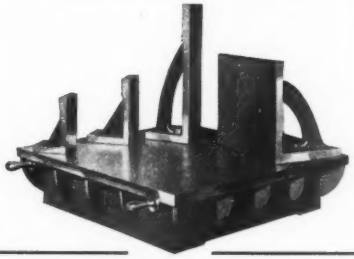

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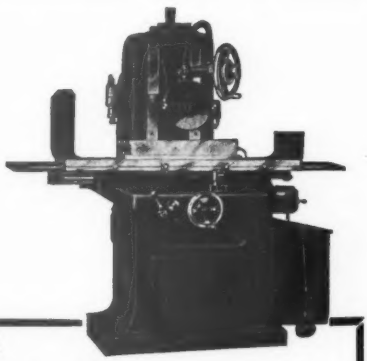

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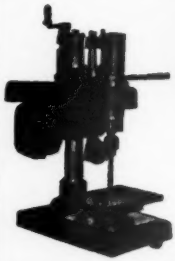

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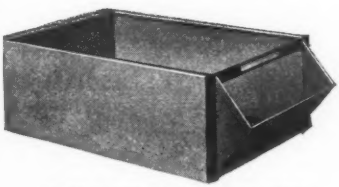

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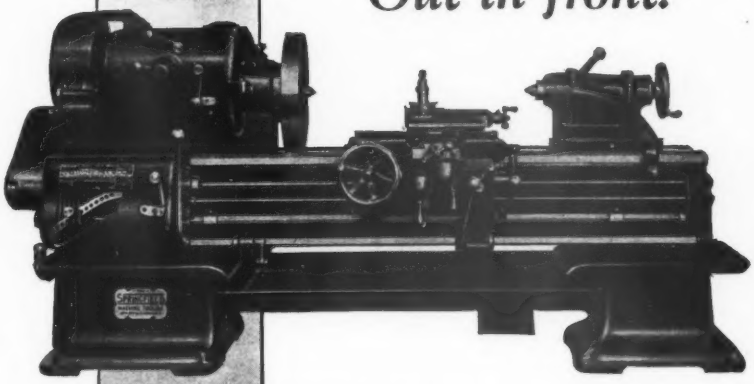

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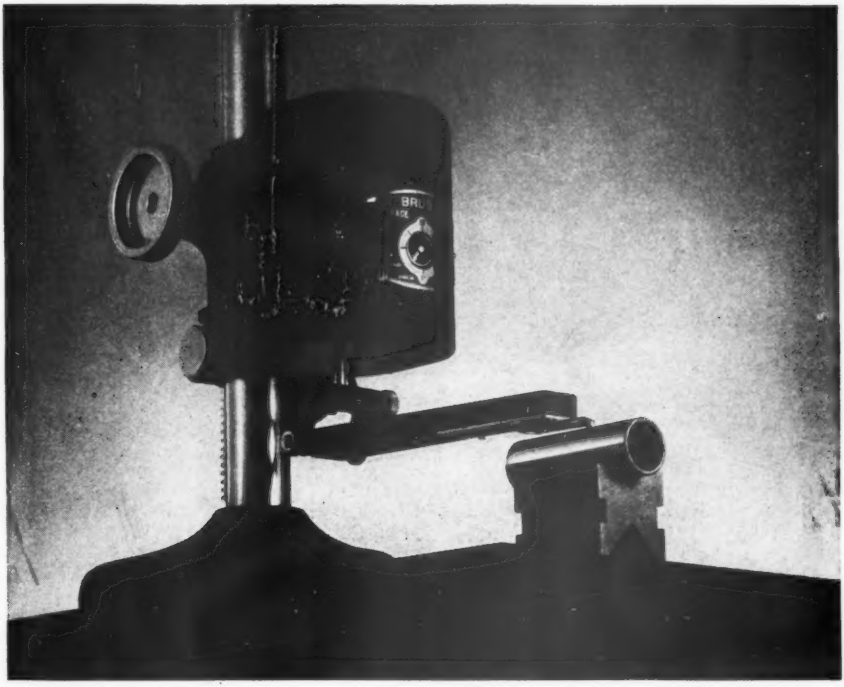

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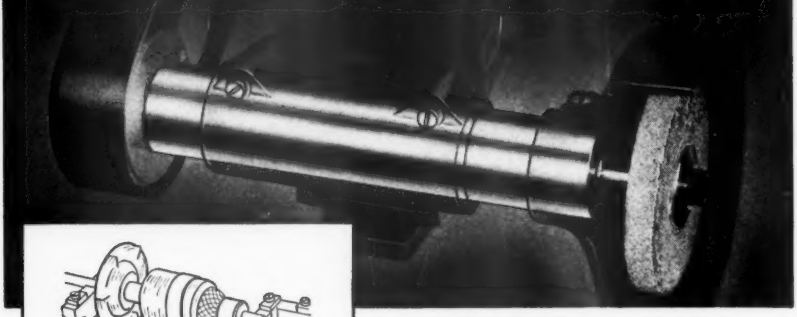

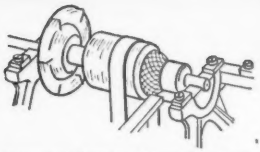

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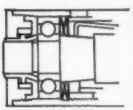

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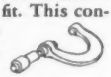

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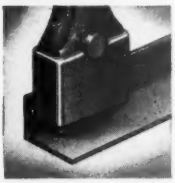

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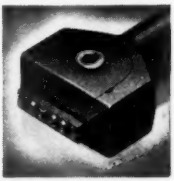

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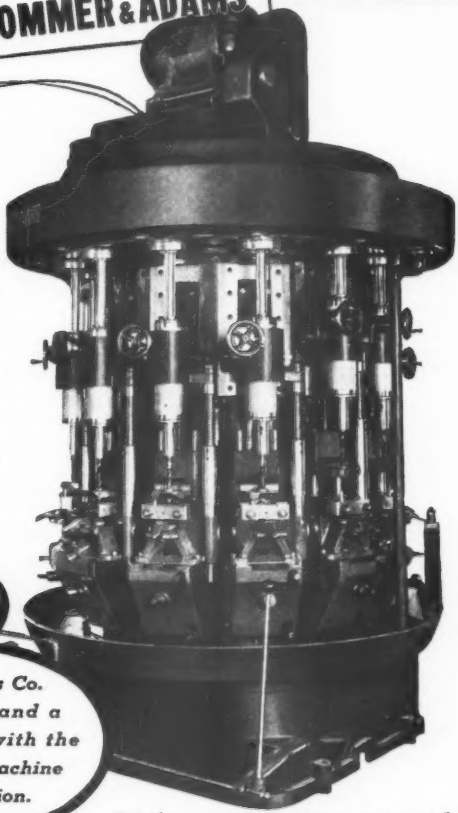

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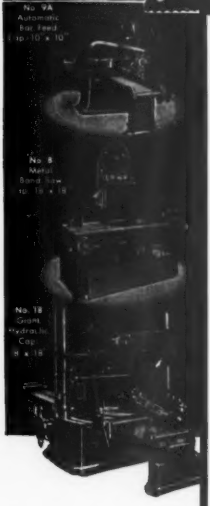

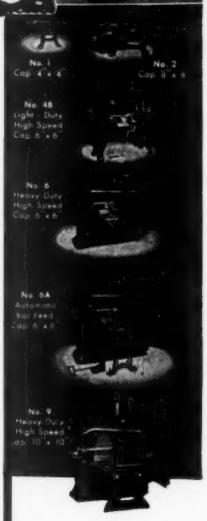

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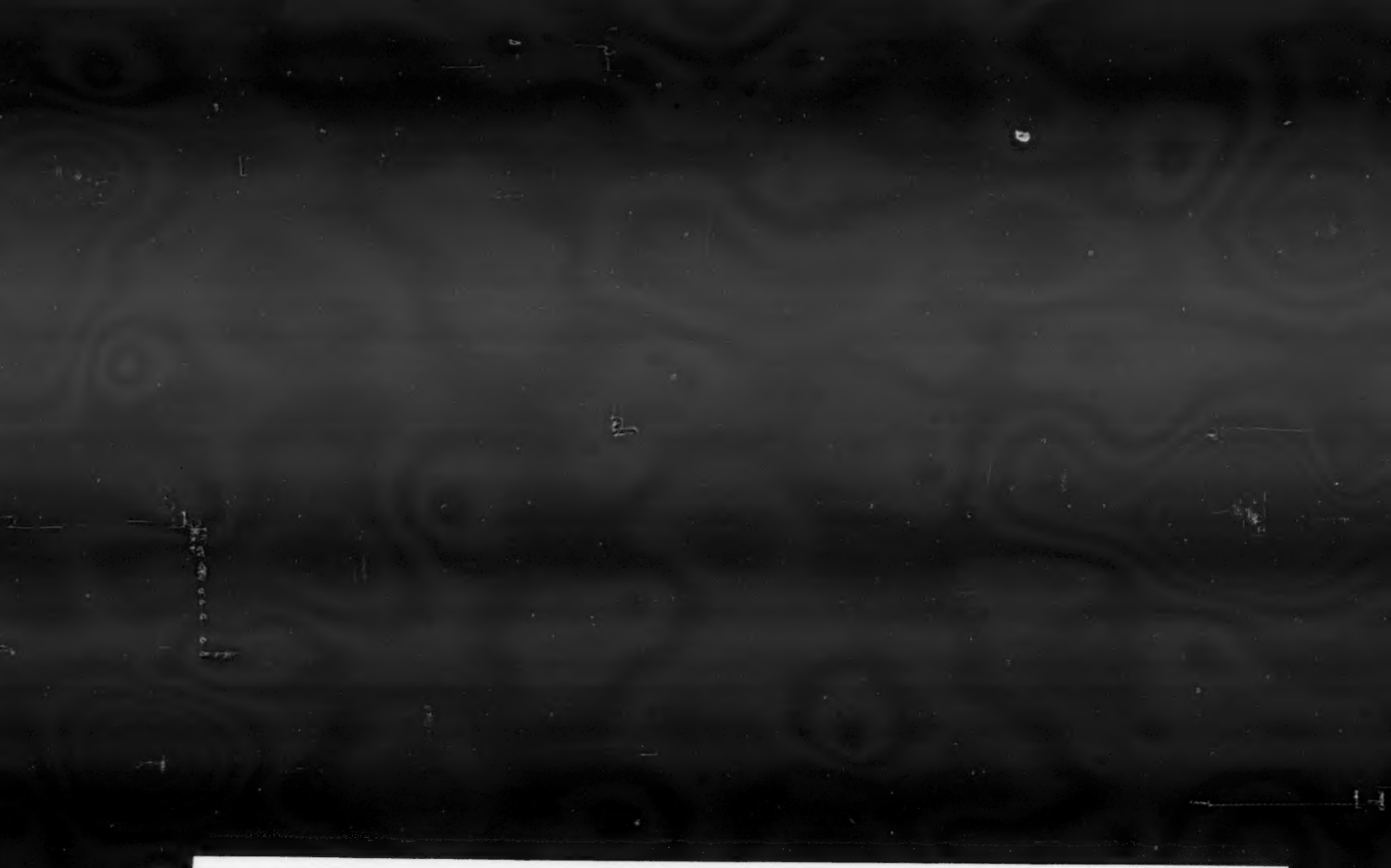
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